



## Workshop Manual SpaceFox, Space Cross, Suran, Suran Cross, Sportvan 2006 ➤

### Electrical equipment

Edition 05.2011

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## List of Workshop Manual Repair Groups

### Repair Group

- 27 - Starter, alternator, battery
- 90 - Instrument case, indicators
- 92 - Windshield wiper and washer, rear window and headlights
- 94 - Switches, lights and external lamps
- 96 - Switches, lights and internal bulbs, alarm
- 97 - Cables and wiring harnesses

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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## 27 – Starter, alternator, battery

### 1 Battery -A- - guidelines



#### WARNING

*Risk of injuries. Observe safety warnings and instructions  
⇒ page 2.*



#### Caution

*To avoid damages to the Battery -A- or to the vehicle. Pay attention to the notes concerning the types of batteries  
⇒ page 1.*



#### Note

*Due to production reasons, different types of battery are installed.  
The work instructions herein described apply to all types of Battery -A-. Deviations and specific work procedures should be assumed for each type of Battery -A-.*

#### 1.1 Fundamental principles for the subject Battery -A-

In order to ensure a long durability for the Battery -A- , check and perform the maintenance according to the descriptions available in this Repair Manual.

Besides the function of supplying power for the start, the Battery -A- has other functions such as storage and supply of electric power for the main supply of vehicle.

#### 1.2 Battery types

##### 1.2.1 Low maintenance batteries

Low maintenance batteries with liquid electrolyte (standard battery). This battery is identified by its removable cell covers.

This type of Battery -A- requires a check for electrolyte level within regular intervals and filling with distilled water, if necessary.

These batteries are often equipped with a charge eye (peephole viewer) that through a colored indication provides information about the charge and electrolyte level status of Battery -A- .



## 1.2.2 Maintenance-free batteries

Maintenance-free batteries with liquid electrolyte (standard battery). This battery has a cover over the cells instead of removable covers. This cover is used only during supply at production.



### Caution

*The cover must not be removed under any circumstances, because this operation could damage the Battery -A- and make it useless consequently.*

This kind of battery does not require any distilled water supply under normal conditions of use.

These batteries are often equipped with a charge eye (peephole viewer) that through a colored indication provides information about the charge and electrolyte level status of Battery -A- .

## 1.2.3 AGM Batteries (Absorbent glass mat)

Maintenance-free batteries with liquid electrolytes submerged in microporous glass fibre (AGM).

This kind of battery does not require any distilled water supply under normal conditions of use.



### Note

- ◆ *The check and charge procedure of AGM and gel batteries is identical.*
- ◆ *Always replace a Battery -A- AGM by other AGM.*

## 1.2.4 Gel battery

Maintenance-free batteries with electrolyte composed of gel.

This kind of battery does not require any distilled water supply under normal conditions of use.



### Note

- ◆ *The check and charge procedure of AGM and gel batteries is identical.*
- ◆ *Gel batteries are usually used by VW for motor homes only.*

## 1.3 Warning notes and safety rules

### 1.3.1 Risks inherent to handling automotive batteries

Know and avoid risks

The handling of batteries offers some risks. However, these risks can be avoided if the information mentioned on the battery, in the owner's manual/instructions for use and in ELSA system are duly respected.

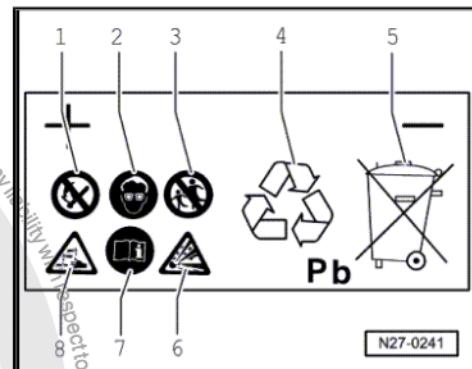


## WARNING

- ◆ *Inexperienced people and without any training can solely carry out work on automotive batteries under expertise supervision, such as an automobile mechanic or electrician duly authorized and qualified.*
- ◆ *Electrolyte is highly corrosive. Should the batteries be handled improperly, there is a risk of people being exposed to their toxic effects. For this reason, means to neutralize the effects caused by acid should be available, such as a soap solution.*
- ◆ *In case the electrolyte of Battery -A- spills, skin burns and vehicle corrosion might occur and damage the components that are relevant for the safety.*
- ◆ *The gas formed during the charging procedure and the gas proceeding from the ventilation of Battery -A- after charging is explosive. In extreme cases, incorrect handling may result in explosion of Battery -A-.*
- ◆ *It is forbidden to generate fire, sparks, open fire and smoking near to the Battery -A-. Avoid sparks and electrostatic discharges when handling cables and electrical equipment. Always touch the vehicle body prior to touching the Battery -A-.*
- ◆ *Only carry out work on batteries in well ventilated and proper locations.*

### 1.3.2 Safety symbols on the Battery -A-

- 1 - Fires, sparks, naked flames and smoking are prohibited.
- Avoid sparks and electrostatic discharge when handling cables and electrical equipment.
- Avoid short circuits (never lay tools over a battery).
- 2 - Wear protective goggles.
- 3 - Keep children away from acid and batteries.
- 4 - Disposal:  
Dispose old batteries at a battery collection center (supplier).
- 5 - Never place the Battery -A- that was replaced at the domestic wastebasket!
- 6 - Explosion risk:  
- A highly explosive oxydric gas mixture is produced while charging batteries.
- 7 - Perform the duties mentioned in the Battery -A-, on the electrical system repair manual and operation manual.
- 8 - Danger of acid burns:  
- The solution of the Battery -A- is very corrosive, thus wear protective goggles and gloves.
- Never throw down the Battery -A-. Acid may leak from degassing openings.

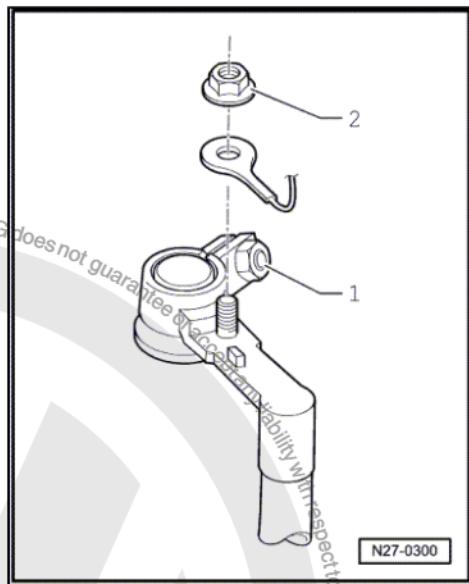


### 1.4 Connection terminals of Battery -A-

In order to avoid damages to the terminals and poles of Battery -A-, it is required to pay attention to the following:



- ◆ Battery pole terminals shall be fitted manually without any force so to prevent damage to the battery case.
- ◆ Do not lubricate the poles of Battery -A- .
- ◆ Assemble the poles terminals of Battery -A- so that the battery pole is aligned to the terminal or passes slightly over the pole.
- ◆ The tightening torque for pole terminals of Battery -A- 1 and additional terminals -2- are shown in table "Tightening torque. Battery" [⇒ page 42](#) .
- ◆ Upon reconnecting the Battery -A-, check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.





## 2 Battery -A- - Check



### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*



### Caution

*To avoid damages to the Battery -A- or to the vehicle, pay attention to the notes concerning the types of batteries  
⇒ page 1.*

### 2.1 Check sequence of a battery

The checks shall be kept in the following sequence:

1. Visual checking ⇒ page 5 .
2. Check Battery -A- equipped with charge eye (peephole viewer) ⇒ page 6 or check the Battery -A- of low maintenance ⇒ page 7 .
3. Check the resting voltage of Battery -A- ⇒ page 10
4. Check the charge of Battery -A- with Battery tester with printer -VAS 5097A- ⇒ page 11 .

### 2.2 Visual checking



### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

Perform a visual check of the external condition , the connection terminals and fixing of the battery prior to any extensive measurements, without any postponement.



### Caution

- ◆ *The incorrect fixing of the battery could damage it.*
- ◆ *Vibrations reduce the lifecycle of the battery, cause risk of explosions, damage cell plates and make the bracket damage the case of Battery -A- .*
- ◆ *Check the fastening of Battery -A- ; If necessary, tighten the attaching screw to the indicated torque ⇒ page 42*

- ◆ Check whether the battery case is damaged. If the battery case is damaged, the acid may leak. Spilled electrolyte causes severe damages to the vehicle. If necessary, neutralize the effects caused by the acid with a soap solution.
- ◆ Check whether the battery terminals and poles are damaged. If the battery poles are damaged, the necessary terminal contacts are not guaranteed. When connecting battery terminals, tighten them according to the torque specified in the workshop manual. If the battery pole terminals are not correctly fitted and tightened, the cables might burn and result in function failures



of the electrical system. In this case, the correct operation of the vehicle is not guaranteed.

## 2.3 Inspection of Battery -A- equipped with charge eye (peephole viewer)



### WARNING

*Risk of injuries! Observe safety warnings and instructions [⇒ page 2](#)!*

The observation hole (peephole) -arrow- provides information on the charge state and electrolyte levels of Battery -A- .

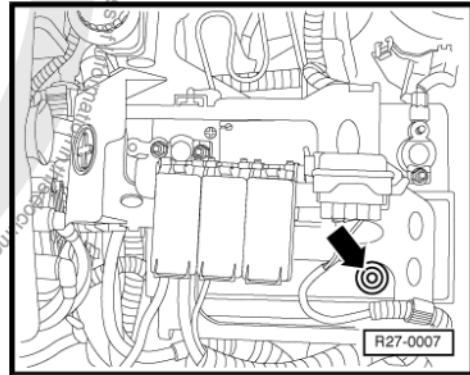
There are two types of batteries with magic eye:

- ♦ Low maintenance [⇒ page 1](#) .
- ♦ Maintenance-free [⇒ page 2](#) .



### Note

*Since the observation hole is located in a single battery cell, the indication refers to this cell. Battery conditions can only be determined with precision via a charge test [⇒ page 5](#)*



- Prior to any visual check, tap the observation hole slightly and carefully with the handle of a screwdriver.

This way, eventual air bubbles which may influence the reading are eliminated and the hole's color indication is more accurate.



### Note

- ♦ Air bubbles can be formed under the observation hole when the battery was recharged or was charged whilst driving. They corrupt the color indication on the observation hole.
- ♦ Be on the watch for batteries that are older than 5 years and the color indication on the observation hole is colorless. In this case, the battery shall be replaced by a new one.
- ♦ The observation hole can be positioned at different points of the battery.

Three different color displays are possible:

- ♦ Green: the battery is sufficiently charged.
- ♦ Black: battery partially charged, charge status < 65 % or uncharged; the battery must be charged.
- ♦ Colorless or yellow: critical acid level is reached; battery shall be replaced.



### Note

- ♦ Charge the Battery -A- with Onboard supply charger unit -VAS 5095A- [⇒ page 16](#) .
- ♦ Charge the Battery -A- with Onboard supply charger unit -VAS 5900- [⇒ page 20](#) .



## 2.4 Inspection of Battery -A- of low maintenance



### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

This kind of battery requires a check for electrolyte level within regular intervals and filling with distilled water, if necessary.

### 2.4.1 Check the electrolyte level

Check the electrolyte level in the case

- Check electrolyte levels via the MAX and MIN marks -arrow- on the battery case.

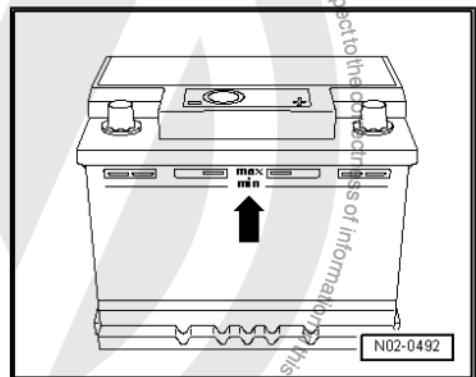
The electrolyte level is considered regular when it matches the mark MAX.

If the electrolyte level is below the mark MAX:

- Fill with distilled water ⇒ page 8 .

Check the electrolyte level in the cells

- Turn the ignition and all electrical consumers off.
- If there is any protection sticker for removable covers, remove it.



*The adhesive with the warning notes shall remain on the battery.*

- Loosen the removable covers of the cells.
- Check the electrolyte level in the battery cells.

The electrolyte level is considered regular when it matches the plastic rib -1-.



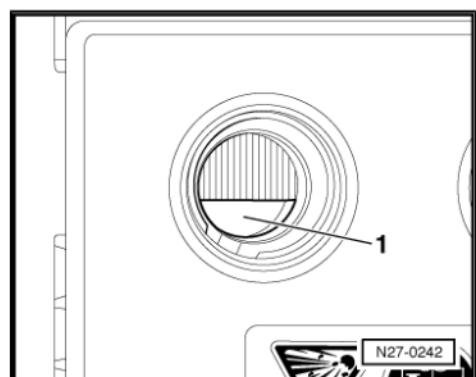
*The plastic rib corresponds to the maximum mark of electrolyte level.*

If the electrolyte level is regular:

- Check cell covers and O-Rings for damages. Damaged components shall be replaced.
- Close the cells with their respective covers.

If the electrolyte level is below the plastic rib:

- Fill with distilled water ⇒ page 8 .





## 2.4.2 Fill with distilled water

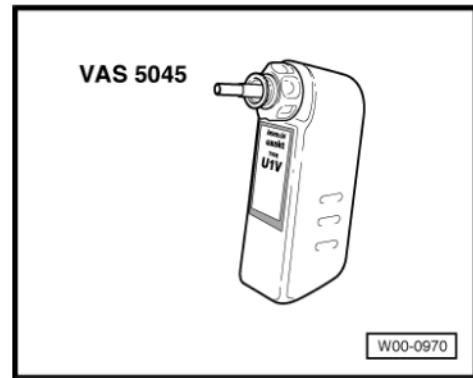


### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

Special tools and workshop equipment required

- ◆ Battery filler -VAS 5045-



### Caution

- ◆ *Filling with electrolyte or liquid other than distilled water damages the Battery -A-. Fill with distilled water.*
- ◆ *A Battery -A- may damage due to excessive filling of the cells. To fill to volume, only use Battery filler -VAS 5045-. The configuration of the fill nozzle avoids excessive filling of the cells and battery acid leakage.*

- Turn the ignition and all electrical consumers off.
- If there is any protection sticker for removable covers, remove it.



### Note

*The adhesive with the warning notes shall remain on the battery.*

- Loosen the removable covers of the cells.
- Fill to volume with distilled water using Battery filler -VAS 5045-. Once the maximum level is reached, the filling is automatically interrupted.
- Check cell covers and O-Rings for damages. Damaged components shall be replaced.
- Close the cells with their respective covers.
- Check the charge of Battery -A- ⇒ page 11 .



### 2.4.3 Electrolyte density check

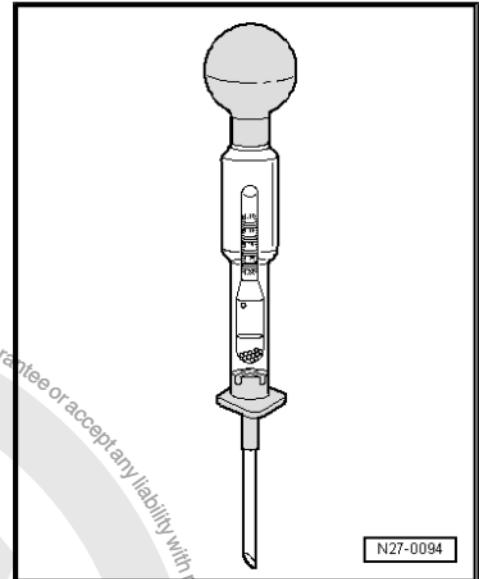


#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
[⇒ page 2!](#)*

Special tools and workshop equipment required

- ◆ Commercially available densimeter



- Turn the ignition and all electrical consumers off.
- If there is any protection sticker for removable covers, remove it.



#### Note

*The adhesive with the warning notes shall remain on the battery.*

- Loosen the removable covers of the cells.
- Check the battery's electrolyte level [⇒ page 7](#).
- Submerge the densimeter in one cell and remove electrolyte until the densimeter ball circulates freely in this electrolyte.

*The higher the specific electrolyte density the more the ball will emerge from the electrolyte. The value can be read from the ball scale.*

Electrolyte density	Charge status	Tension
1.28 g/cm <sup>3</sup>	100 %	12.7 V
1.21 g/cm <sup>3</sup>	60 %	12.3 V
1.18 g/cm <sup>3</sup>	40 %	12.1 V
1.10 g/cm <sup>3</sup>	0 %	11.7 V



#### Note

*The electrolyte density check immediately after the filling with distilled water will show an incorrect measurement result. Check the electrolyte density only after the charge of Battery -A- .*

- Check cell covers and O-Rings for damages. Damaged components shall be replaced.
- Close the cells with their respective covers.

## 2.5 Check of the resting voltage of Battery - A-



### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

The measurement of the resting voltage is used to establish the capacity of a Battery -A- .



#### Note

*The battery shall not have been charged or discharged the past two hours prior to the measurement. The charge or discharge processes during this period result in an incorrect measurement.*

Resting voltage	Charge status	Battery status
11.70 V	0 %	Uncharged, without charge, Fully uncharged ⇒ page 33
12.20 V	50 %	Depending on the elapsed time, sulphate crystals are formed and which are only reversible with a large addition of power. At the same time, a large expansion of active mass occurs, which can lead to crack forming and consequent higher corrosion of the plates.
12.35 V	65 %	◆ On batteries with Magic Eye, the indication changes from green to black ◆ On new/stored vehicles, it is necessary to charge the battery.
12.70 V	100 %	Full capacity.

Special tools and workshop equipment required

- ◆ Portable multimeter or EQ 7318 -VAG 1526C-





- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the negative pole of the battery [⇒ page 34](#).
- Wait for at least 2 hours. During this period, it is not allowed to charge or discharge the battery.
- Check the resting voltage of Battery -A- with Portable multimeter or EQ 7318 -VAG 1526C-.

Measurement value	Procedure
Resting voltage $\geq$ 12.5 V	Resting voltage is regular, check the battery's charge <a href="#">⇒ page 11</a>
Resting voltage $<$ 12.5 V	Charge battery <a href="#">⇒ page 16</a>

If the battery has been charged, proceed as follows based on the measurement result:

- Wait for at least 2 hours. During this period, it is not allowed to charge or discharge the battery.
- Measure the battery's voltage at rest with Portable multimeter or EQ 7318 -VAG 1526C-.

If, after the charge, the resting voltage of Battery -A- is  $<$  12.5 V, replace the Battery -A- [⇒ page 38](#).

## 2.6 Charge inspection of Battery -A-

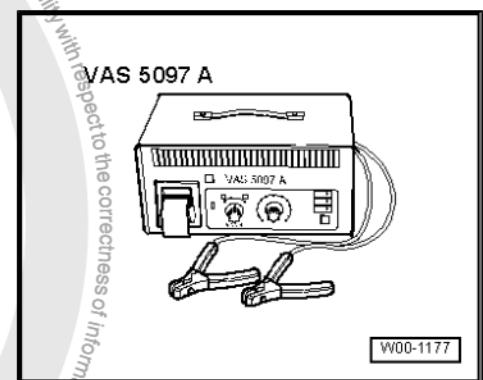


### WARNING

*Risk of injuries! Observe safety warnings and instructions  
[⇒ page 2](#)!*

Special tools and workshop equipment required

- ◆ Battery tester with printer -VAS 5097A-



Description and additional information [⇒ page 14](#).

### 2.6.1 Charge inspection of Battery -A- with Battery tester with printer -VAS 5097A-

- Turn the ignition and all electrical consumers off.
- Check the resting Voltage of Battery -A- [⇒ page 10](#)
- Adjust the cold test current of the battery to amperes (A), according to the DIN standard.

Should the value shown on the battery not be in accordance to the DIN standard, but to the IEC or EN/SAE standard, this value



shall be converted with help of the table [⇒ page 12](#) or the table on the device.

- Select the cold test current with the cold test current selection switch [⇒ page 15 -5-](#).
- Select measurement range 80 - 379 A and/or 380 - 499 A, using the function switch and ON/OFF [⇒ page 15 -6-](#).
- Turn the device's red terminal "+" to test the positive pole.
- Turn the device's black terminal "-" to test the negative pole.

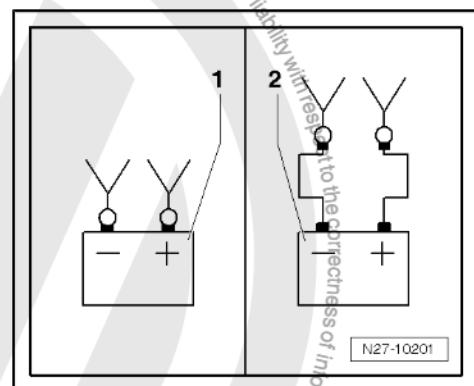


*Check if the test terminals show good contact!*

- Select the connection point at the test terminals with the switch [⇒ page 15 -7-](#).
- 1 - Direct connection to the battery.
- 2 - Connection to the outer test point in the engine compartment.
- Check if the cold test current indicated on the battery corresponds to the adjusted value for battery testing.
- Press the activation key [⇒ page 15 -4-](#).

The green LED will turn on [⇒ page 15 -1-](#). The test program starts automatically. The test result is obtained through printer [⇒ page 15 -9-](#).

- Turn off device [⇒ page 15 -6-](#).
- Remove the test terminals.



- ◆ *The test is finished after approximately 20 seconds.*
- ◆ *The test results are obtained through a printer.*
- ◆ *Perform the test only once. Test repetition will lead to incorrect results.*

Table: cold test current

Cold test current at A			
EN/SAE	IEC	⇒	DIN
136 - 17	95 - 124	⇒	80 - 104
178 - 219	125 - 154	⇒	105 - 129
220 - 261	155 - 184	⇒	130 - 154
262 - 303	185 - 214	⇒	155 - 179
304 - 345	215 - 244	⇒	180 - 204
346 - 387	245 - 274	⇒	204 - 229
388 - 429	275 - 304	⇒	230 - 254
430 - 471	305 - 334	⇒	255 - 279
472 - 513	335 - 364	⇒	280 - 304
514 - 555	365 - 394	⇒	305 - 329
556 - 597	395 - 424	⇒	330 - 354
598 - 639	425 - 454	⇒	355 - 379
640 - 657	455 - 464	⇒	380 - 389



Cold test current at A			
EN/SAE	IEC	⇒	DIN
658 - 675	465 - 474	⇒	390 - 399
676 - 693	475 - 484	⇒	400 - 409
694 - 711	485 - 494	⇒	410 - 419
712 - 729	495 - 504	⇒	420 - 429
730 - 747	505 - 514	⇒	430 - 439
748 - 765	515 - 524	⇒	440 - 449
766 - 783	525 - 534	⇒	450 - 459
784 - 801	535 - 544	⇒	460 - 469
802 - 819	545 - 554	⇒	470 - 479
820 - 837	555 - 564	⇒	480 - 489
838 - 855	565 - 574	⇒	490 - 499 <sup>1)</sup>

1) Batteries with a 520 A cold test current in accordance to DIN standard can be checked with a regulation of 499 A in accordance to DIN standard.

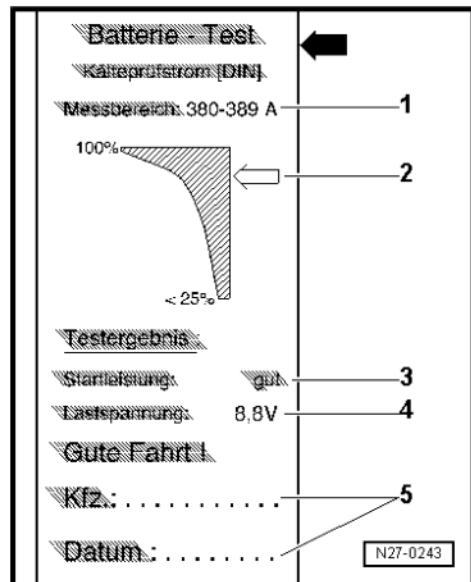


### Interpretation of the test results

- 1 - Measurement range selected in the equipment.
- 2 - Diagram, the -arrow- indicates the state of Battery -A- .
- 3 - Test result.
- 4 - Tension existing in the Battery -A- during the charge test.
- 5 - Vehicle data and date. They shall be filled in by the person who is responsible for the test.

Due to a strong charge in the Battery -A- during the test (a high current flows), the tension of the battery will be reduced.

- ◆ If the Battery -A- is regular, the voltage value decreases only up to the minimal voltage.
- ◆ If the Battery -A- is damaged or with low charge, the tension of Battery -A- will lower quickly for values below the minimum tension.
- ◆ After check, this low voltage value will remain for certain time and then increase slowly.
- ◆ Perform the test only once. Test repetition will lead to incorrect results.



*The printing of the test result is required for the replacement process under guarantee.*

Print of the equipment for battery test	Measures to be taken
Starting power is very good	Battery -A- In order
Starting power is good	Battery -A- In order
Insufficient starting power	Charge the Battery -A- <sup>2)</sup>
Starting power is poor	Charge the Battery -A- <sup>2)</sup>
Starting power is very poor	Charge the Battery -A- <sup>2)</sup>
Not fit for tests	Charge the Battery -A- <sup>2)</sup>

2) After battery recharge, perform the battery charge test again. If new indications appear again "insufficient startup power, deficient startup power, very deficient startup power or not apt for testing", the battery must be replaced.

### 2.6.2 Battery tester with printer -VAS 5097A-



#### WARNING

*Danger of injuries! Pay attention to the warnings and safety instructions **⇒ page 2!***

It is not necessary to disconnect or remove the Battery -A- to use the Battery tester with printer -VAS 5097A- .

The Battery tester with printer -VAS 5097A- allows the inspection of 12-V batteries with:

- ◆ 80 - 499 A cold test current in accordance to DIN standard (Deutsche Industrie Norm - German Industry Norm)<sup>(3)</sup>
- ◆ 95 - 574 A cold test current in accordance to IEC (International Engineering Consortium)



- ◆ 136 - 855 A cold test current in accordance to EN/SAE (European Standard/Standard of Automotive Engineers)

3) Batteries with a 520 A cold test current in accordance to DIN standard can be checked with a regulation of 499 A in accordance to DIN standard

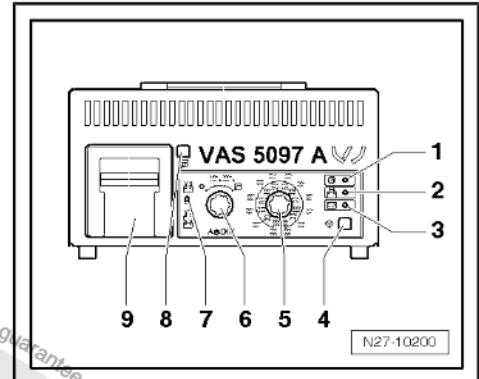
In order to perform the test, batteries are charged with a current that corresponds to the starting current of a passengers vehicle. A Battery -A- is evaluated with this charge and the measurement result is obtained through a printer.

 Note

- ◆ Pay attention to the ⇒ usage instructions for the Battery tester with printer -VAS 5097A- or to label ⇒ Brief instructions on the Battery tester with printer -VAS 5097A- on the device or to table: Cold test current [⇒ page 12](#)
- ◆ Pay attention to the instructions for use by the battery manufacturer!

Battery tester with printer -VAS 5097A-

- 1 - green LED, "device working"
- 2 - red LED, "device on with poles connected"
- 3 - red LED, "battery not compatible with the test", charge battery
- 4 - Activation key
- 5 - Cold test current selection switch
- 6 - Function switch ON/OFF
- 7 - Selection switch for connection point (test equipment is connected to battery/outer checking point at the engine compartment)
- 8 - Paper forward key
- 9 - Printer





### 3 Battery -A- - charge



#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*



#### Caution

*In order to prevent damages to the battery or vehicle, pay attention to the notes about battery types ⇒ page 1*

#### 3.1 Onboard supply charger unit -VAS 5095 A-

This chapter describes the basic functions of Onboard supply charger unit -VAS 5095 A-. For more information, check the ⇒ usage instructions for the Onboard supply charger unit -VAS 5095 A-.

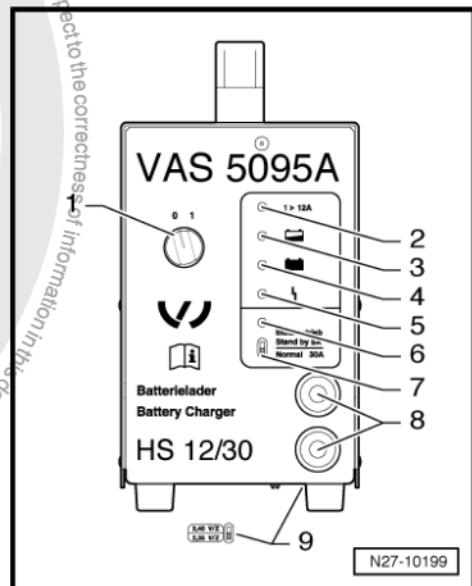


#### Note

- ◆ Pay attention to the ⇒ usage instructions for the Onboard supply charger unit -VAS 5095 A-.
- ◆ Pay attention to the instructions for use by the manufacturer of the Battery -A- !

##### Onboard supply charger unit -VAS 5095 A-

- 1 - Switch ON/OFF (0 = charger off)
- 2 - Indication of charge current ( $I > 12$  A)
- 3 - Indication of charge current; battery partially charged > 90 %
- 4 - Charge maintenance, the green lamp lights up when battery is charged
- 5 - Indication of fault
- 6 - Indication of auxiliary operation
- 7 - Selection switch for auxiliary/normal operation
- 8 - Charge cable, red charge terminal "+", black charge terminal "-"
- 9 - Selection switch of the battery type (at the charger's base)



#### 3.1.1 Charge the battery with Onboard supply charger unit -VAS 5095A-



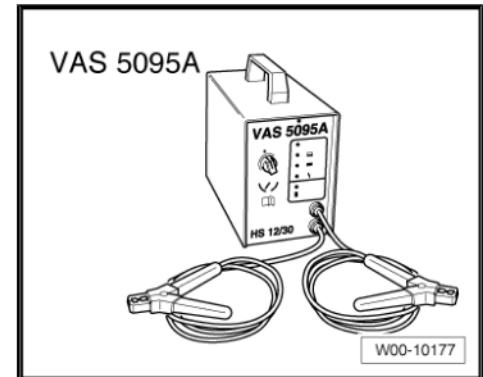
#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

Special tools and workshop equipment required



- ◆ Onboard supply charger unit -VAS 5095A-



#### Caution

*During the charge, always adjust the type of Battery -A- to 2.4 V/C (Volt/cell)! This indication applies to all batteries.*



#### Note

- ◆ A Battery -A- shall be at a minimum temperature of 10 °C.
- ◆ In case of batteries with removable covers, do not open the covers during recharge.

- Turn the ignition and all electrical consumers off.
- Check the battery type adjustment on the selection switch (battery type) [⇒ page 16](#) -9-. It shall be adjusted to 2.4 V/C (Volt/cell).
- Turn the charger's red charge terminal "+" to the battery's positive pole.
- Turn the charger's black charge terminal "-" to the battery's negative pole.
- Switch on charger [⇒ page 16](#) -1-.

Charge current indications [⇒ page 16](#) -2- and -3- are shown by a yellow LED. The battery is partially charged (approx. 90 %) when yellow LED -3- turns on.

If green LED [⇒ page 16](#) -4- also turns on, this means the charger commuted to charge maintenance. A Battery -A- is charged.

- Turn off charger [⇒ page 16](#) -1-.
- Remove the charging terminals from the battery poles.

### 3.1.2 Charge an extremely uncharged battery with Onboard supply charger unit -VAS 5095A-



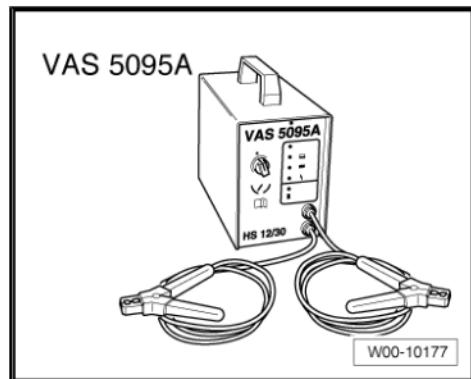
#### WARNING

*Risk of injuries! Observe safety warnings and instructions [⇒ page 2](#)!*

Special tools and workshop equipment required



- ◆ Onboard supply charger unit -VAS 5095A-



The charger automatically recognizes very discharged batteries and starts the charging process with a lower charging current in order to preserve them. The charging current is automatically adjusted to the charge status of the battery.



Note

- ◆ Pay attention to the notes in chapter "Fully discharged batteries" [⇒ page 33](#).
- ◆ The minimum battery voltage shall be 0.6 V!
- Charge battery [⇒ page 16](#).

### 3.1.3 Auxiliary operation with Onboard supply charger unit -VAS 5095A



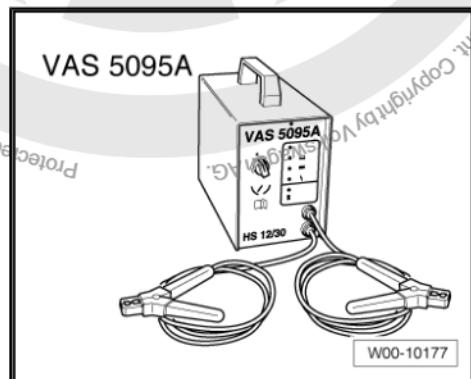
**WARNING**

*Risk of injuries! Observe safety warnings and instructions [⇒ page 2](#)!*

During auxiliary operation, Onboard supply charger unit -VAS 5095A- takes on the functions of the damaged battery in the vehicle when it is replaced. The on board voltage remains unchanged. The vehicle electrical equipment (e.g. power windows) can be used.

#### Special tools and workshop equipment required

- ◆ Onboard supply charger unit -VAS 5095 A-





Caution

- ◆ During charge, always adjust the battery type to 2.4 V/C (Volt/cell)! This indication applies to all batteries.
- ◆ The charge terminals for Onboard supply charger unit - VAS 5095A- cannot be detached from the battery pole's terminals when it is being replaced.

- Turn the ignition and all electrical consumers off.
- Adjust selection switch for auxiliary/normal operation [⇒ page 16 -7-](#) for "auxiliary operation".
- Turn the charger's red charge terminal "+" of the vehicle's positive pole terminal charger.
- Turn the charger's black charge terminal "-" of the vehicle's negative pole terminal charger.
- Check the battery-type adjustment on the selection switch for battery type [⇒ page 16 -9-](#). It shall be adjusted to 2.4 V/C (Volt/cell).
- Switch on charger [⇒ page 16 -1-](#).

The yellow LEDs [⇒ page 16 -3- and -6-](#) turns on.



Note

- ◆ A minimum charge of 0.6 A is required (e.g. lantern lights), otherwise, the auxiliary operation can not be turned on.
- ◆ During the auxiliary operation, the current intensity is limited to 5 A.

- Turn the vehicle lantern lights on.
- Replace the battery [⇒ page 38](#).
- Turn off charger [⇒ page 16 -1-](#).
- Remove the charging terminals from the battery poles.
- Again, adjust selection switch for auxiliary/normal operation [⇒ page 16 -7-](#) for "normal operation".

### 3.1.4 Charge stabilizer/maintenance operation with Onboard supply charger unit - VAS 5095A-



WARNING

Risk of injuries! Observe safety warnings and instructions [⇒ page 2](#)!

During the stabilizer's operation, Onboard supply charger unit - VAS 5095A- ensures safe charging and total battery charge maintenance.

- Proceed the same way with the battery charge [⇒ page 16](#).



Note

- ◆ If the battery is uncharged by a consumer during the stabilizer's operation, Onboard supply charger unit -VAS 5095A- automatically ensures the respective recharge.
- ◆ The operation of the stabilizer does not have a time limit.
- ◆ The battery is always ready for use.
- ◆ Pay attention to the instructions for use by the battery manufacturer!

### 3.2 Onboard supply charger unit -VAS 5900-

This chapter describes the basic functions of Onboard supply charger unit -VAS 5900-. For more information, check the ⇒ usage instructions for the Onboard supply charger unit -VAS 5900-.

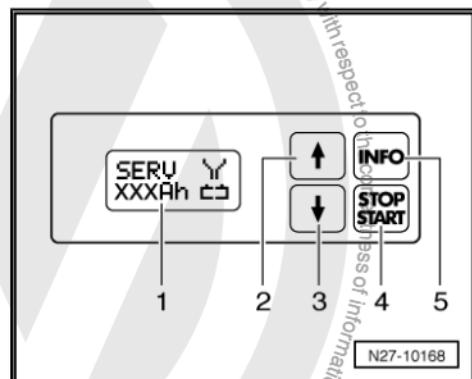


Note

- ◆ Pay attention to the ⇒ usage instructions for the Onboard supply charger unit -VAS 5900-.
- ◆ Pay attention to the instructions for use by the battery manufacturer!

#### Onboard supply charger unit -VAS 5900-

- 1 - Observation hole
- 2 - Adjustment key "Up"
- 3 - Adjustment key "Down"
- 4 - Key "ON/OFF"
- 5 - Key "Information"



#### 3.2.1 Charge the battery with Onboard supply charger unit -VAS 5900-



##### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

Special tools and workshop equipment required



◆ Onboard supply charger unit -VAS 5900-



Note

- ◆ The battery shall be at a minimum temperature of 10 °C.
- ◆ In case of batteries with removable covers, do not open the covers during recharge.

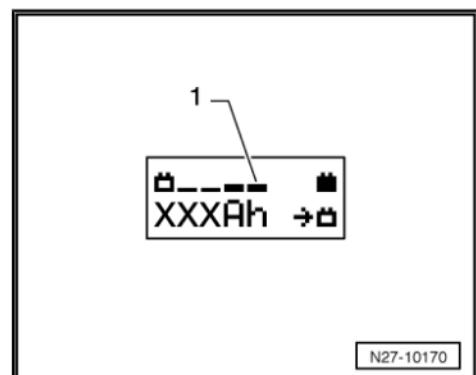
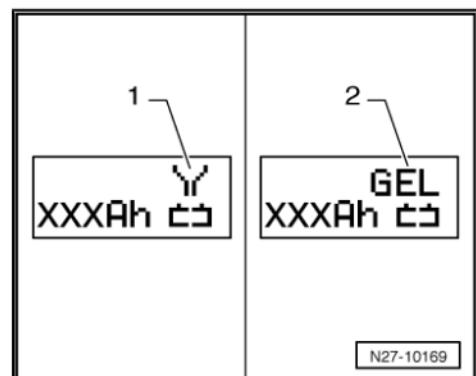
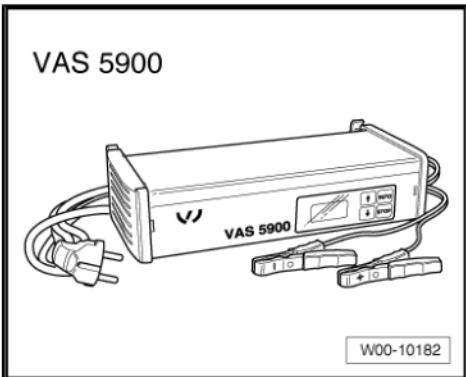
- Turn the ignition and all electrical consumers off
- Connect the charger to a power source. The last selected operation mode will be displayed on the observation hole  
[⇒ page 20 -1-](#)
- Adjust the operation type that corresponds to the battery using **INFO**.

The observation hole shows -1- regarding "normal standard battery charging" or symbol -2- regarding "normal gel/AGM battery charging".

- Adjust the battery's capacity (Ah) with setting key "Up" or "Down" .
- Turn the charger's red charge terminal "+" to the battery's positive pole.
- Turn the charger's black charge terminal "-" to the battery's negative pole.

The charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and automatically starts the charge.

Once reached a charge of approx. 80 - 85 %, the charger starts the "final charge". The observation hole shows the fourth bar -1-. The battery is ready for use.



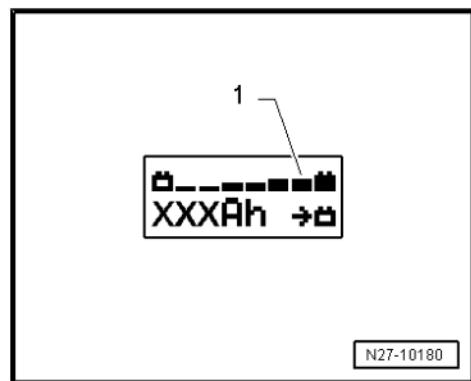


When the charge reaches 100%, the observation hole will display all bars -1-.



Note

- ◆ In the "normal charge" type of operation, it is possible to activate the consumers during charging parallelly. However, charge duration will be prolonged.
- ◆ According to the battery type, the charger switches to charge maintenance after about 1-7 hours. In order to reach 100 % charge, the battery shall remain connected to the charger during this time.



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After charge of the battery:

- Press the **START/STOP**.
- Disconnect the black charge terminal “-” to the battery's negative pole.
- Disconnect the charge red terminal “+” to the battery's positive pole.
- Disconnect the charger from the power source.

Possible faults and respective corrections

- 1 - The battery voltage that is indicated does not correspond to the nominal voltage:
  - Keep “Up” or “Down” pressed until charging begins.
- 2 - The battery voltage that is indicated does not correspond to the nominal voltage - the charge has already started:
  - Press, twice, **START/STOP**.
  - Keep “Up” or “Down” pressed until charging begins.
- 3 - The charger does not recognize any battery if the battery voltage is below 2 V:
  - The indication on the observation hole remains unchanged.

The type of battery and the adjusted ampere/hour (Ah) are indicated.

Finish the charge of the battery:

- Press the **START/STOP**.
- Disconnect the black charge terminal “-” to the battery's negative pole.
- Disconnect the charge red terminal “+” to the battery's positive pole.
- Disconnect the charger from the power source.

### 3.2.2 Service charging with Onboard supply charger unit -VAS 5900-



**WARNING**

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*



Caution

*Operation type "service charging" is not allowed for VW vehicles, since current peaks may damage the on-board electronic system.*

*However, if the type of operation that was used was "service charging", the battery must always be disconnected from the onboard network.*



Caution

*During charging, always adjust the type of operation that matches the battery ⇒ Usage instructions for the Onboard supply charger unit -VAS 5900- !*

*Using the "service charging" is only allowed for:*

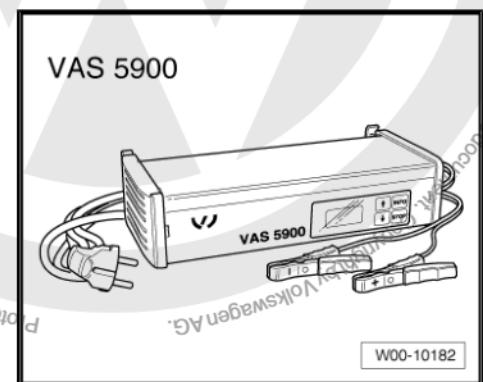
- ◆ Standard batteries which were filled with distilled water.
- ◆ Gel/AGM batteries.

*Do not use the "service charging" operation type for maintenance-free batteries ⇒ page 1 .*

Operation type "service charging (SERV)" is only used when you suspect the battery is damaged (e.g. sulphation). In this case, the battery is charged up to maximum electrolyte density and the plates are reactivated (elimination of the sulphation layer).

Special tools and workshop equipment required

- ◆ Onboard supply charger unit -VAS 5900-



Note

- ◆ The battery shall be at a minimum temperature of 10 °C.
- ◆ In case of batteries with removable covers, do not open the covers during recharge.

- Turn the ignition and all electrical consumers off.
- Disconnect battery ⇒ page 34 .
- Connect the charger to a power source. The last selected operation mode will be displayed on the observation hole ⇒ page 20 -1-.



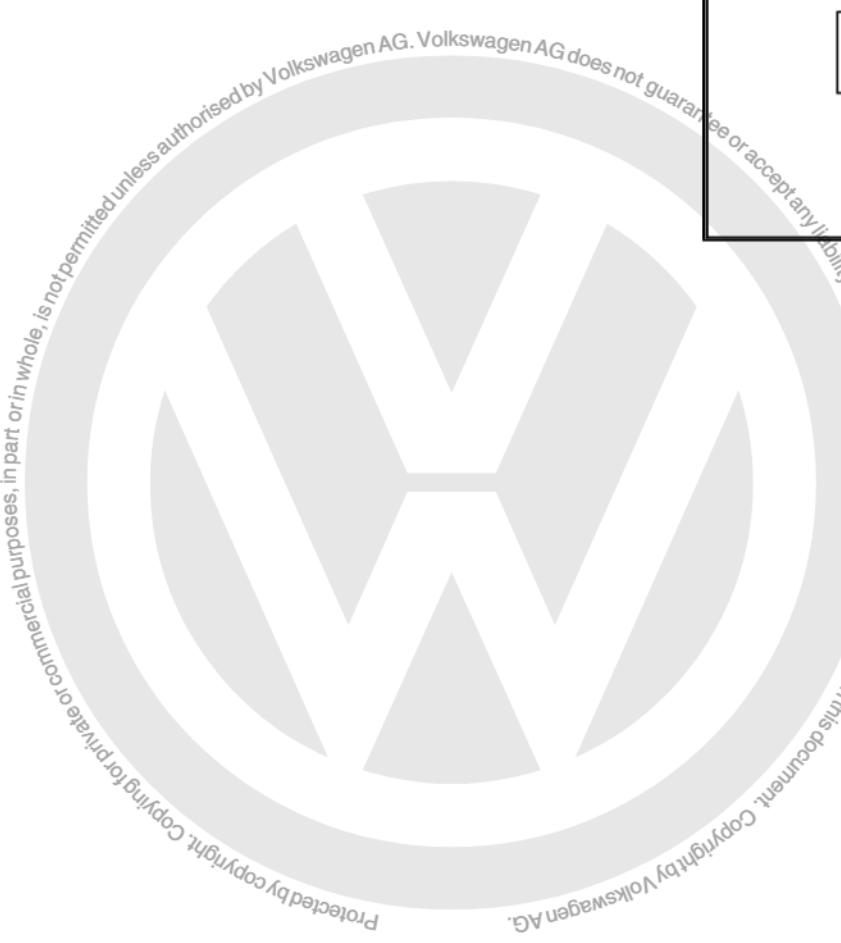
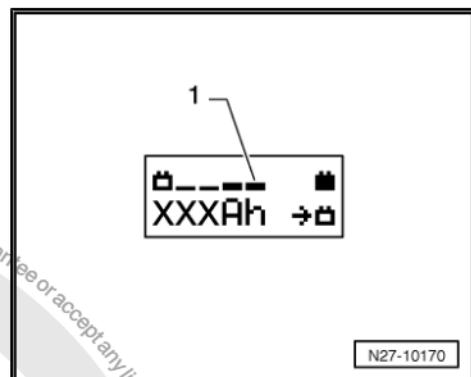
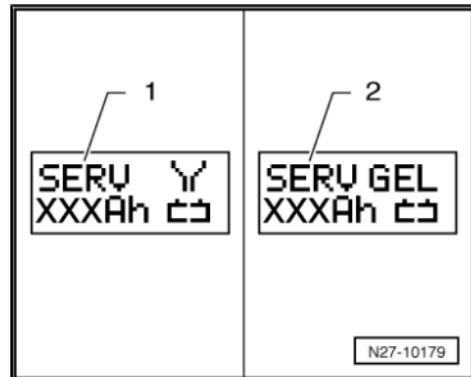
- Adjust the operation type that corresponds to the battery using **[INFO]**.

The observation hole shows -1- regarding "standard battery service charging" or symbol -2- regarding "gel/AGM service battery charging".

- Adjust the battery's capacity (Ah) with setting key "Up" or "Down" .
- Turn the charger's red charge terminal "+" to the battery's positive pole.
- Turn the charger's black charge terminal "-" to the battery's negative pole.

The charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and automatically starts the charge.

Once reached a charge of approx. 80 - 85 %, the charger starts the "final charge". The observation hole shows the fourth bar -1-. The battery is ready for use.





When the charge reaches 100%, the observation hole will display all bars -1-.



Note

*The success of the "service charging" depends on the battery's sulphation level.*

Possible faults and respective corrections

- 1 - The battery voltage that is indicated does not correspond to the nominal voltage:
  - Keep "Up" or "Down" pressed until charging begins.
  - 2 - The battery voltage that is indicated does not correspond to the nominal voltage - the charge has already started:
    - Press, twice, **START/STOP**.
    - Keep "Up" or "Down" pressed until charging begins.
  - 3 - The charger does not recognize any battery if the battery voltage is below 2 V:

The indication on the observation hole remains unchanged.

The type of battery and the adjusted ampere/hour (Ah) are indicated.

Finish the charge of the battery:

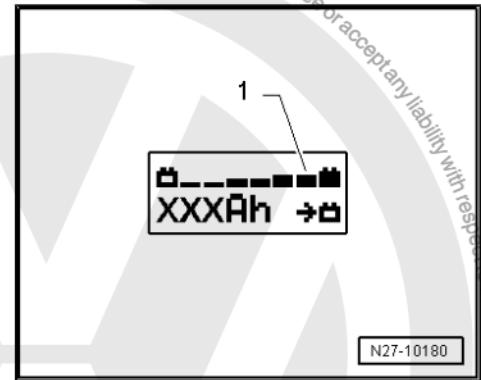
- Press the **START/STOP**.
- Disconnect the black charge terminal "-" to the battery's negative pole.
- Disconnect the charge red terminal "+" to the battery's positive pole.
- Disconnect the charger from the power source.

### 3.2.3 Charge an extremely uncharged battery with Onboard supply charger unit -VAS 5900-



**WARNING**

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*



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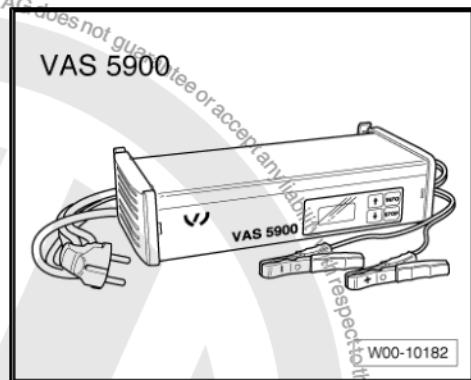
#### Caution

- ◆ The protection device for the proper charge terminal connection is not activated in operation type "overly uncharged/auxiliary operation battery charging". Correctly connect the charge terminal poles to the battery pole terminals!
- ◆ During charging, always adjust the type of operation that matches the battery ⇒ Usage instructions for the Onboard supply charger unit -VAS 5900- !
- ◆ An overly uncharged battery is not recognized by the charger ⇒ [page 33](#).
- ◆ Do not press **START/STOP** if the charging terminals have been connected improperly! The charger can be damaged.

Batteries with voltage lower than 2 V will not be automatically recognized by the Onboard supply charger unit -VAS 5900- .

Special tools and workshop equipment required

- ◆ Onboard supply charger unit -VAS 5900-



#### Note

- ◆ The battery shall be at a minimum temperature of 10 °C.
- ◆ In case of batteries with removable covers, do not open the covers during recharge

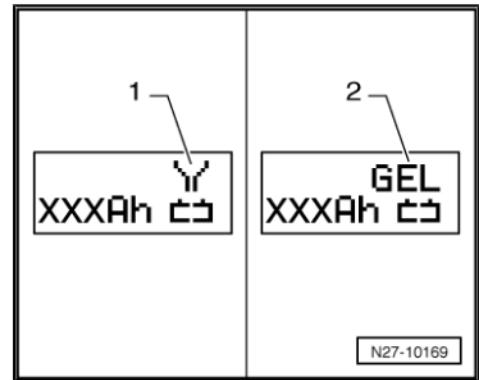
- Turn the ignition and all electrical consumers off.
- Connect the charger to a power source. The last selected operation mode will be displayed on the observation hole  
⇒ [page 20](#) -1-.



- Adjust the operation type that corresponds to the battery using **INFO**.

The observation hole shows -1- regarding "normal standard battery charging" or symbol -2- regarding "normal gel/AGM battery charging".

- Adjust the battery's capacity (Ah) with setting key "Up" or "Down" .
- Turn the charger's red charge terminal "+" to the battery's positive pole.
- Turn the charger's black charge terminal "-" to the battery's negative pole.
- Press the **START/STOP** for approx. 5 seconds. The "Overly uncharged/auxiliary operation battery charging" menu is activated.
- Press the "Up" or "Down" , to adjust the voltage to match the battery (6 V, 12 V or 24 V).



*If no key is pressed within 5 seconds, the charger returns to the main menu (select operation mode).*

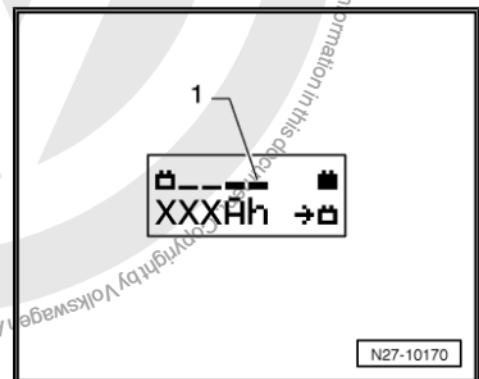
- Confirm the voltage of the selected battery with **START/STOP**.

After that, the correct connection of the charge terminal poles is requested.

- Check if the charge terminal poles are correctly connected.
- Confirm the correct connection of the charge terminal poles with **START/STOP**.

The charger will start charging the very discharged battery.

Once reached a charge of approx. 80 - 85 %, the charger starts the "final charge". The observation hole shows the fourth bar -1-. The battery is ready for use.

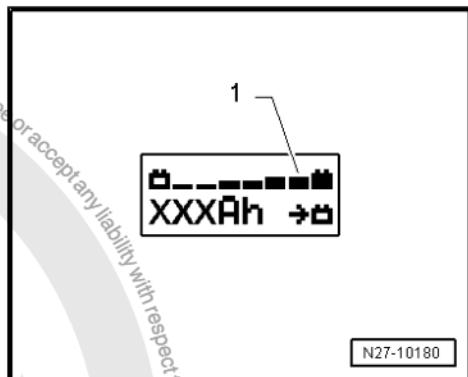




When the charge reaches 100%, the observation hole will display all bars -1-.

After charge of the battery:

- Press the **START/STOP**.
- Disconnect the black charge terminal “-” to the battery's negative pole.
- Disconnect the charge red terminal “+” to the battery's positive pole.
- Disconnect the charger from the power source.



### 3.2.4 Auxiliary operation with Onboard supply charger unit -VAS 5900-



#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2*



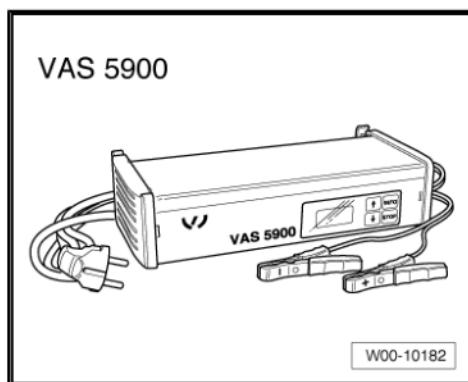
#### Caution

- ◆ The protection device for the proper charge terminal connection is not activated in operation type “overly uncharged/auxiliary operation battery charging”. Correctly connect the charge terminal poles to the battery pole terminals!
- ◆ During charging, always adjust the type of operation that matches the battery ⇒ Usage instructions for the Onboard supply charger unit -VAS 5900- !
- ◆ Do not press **START/STOP** if the charging terminals have been connected improperly! The charger can be damaged.

During auxiliary operation, Onboard supply charger unit -VAS 5900- takes-on the functions of the damaged battery in the vehicle when it is replaced. The on board voltage remains unchanged. The vehicle electrical equipment (e.g., power windows) can be used.

Special tools and workshop equipment required

- ◆ Onboard supply charger unit -VAS 5900-



- Turn the ignition and all electrical consumers off.



- Connect the charger to a power source. The last selected operation mode will be displayed on the observation hole  
⇒ [page 20](#) -1-.
- Turn the charger's red charge terminal "+" to the battery's positive pole.
- Turn the charger's black charge terminal "-" to the battery's negative pole.
- Press the **START/STOP** for approx. 5 seconds. The "Overly uncharged/auxiliary operation battery charging" menu is activated.
- Press the "Up" or "Down" , to adjust the voltage to match the battery (6 V, 12 V or 24 V).



#### Note

*If no key is pressed within 5 seconds, the charger returns to the main menu (select operation mode).*

- Confirm the voltage of the selected battery with **START/STOP**.

After that, the correct connection of the charge terminal poles is requested.

- Check if the charge terminal poles are correctly connected.
- Confirm the correct connection of the charge terminal poles with **START/STOP**.

The charger starts the auxiliary operation.

- Replace the battery ⇒ [page 38](#) .
- Press **START/STOP** to complete auxiliary operation.
- Disconnect the black charge terminal "-" of the vehicle's negative pole terminal charger.
- Disconnect the charge red terminal "+" of the vehicle's positive pole terminal charger.
- Disconnect the charger from the power source.

### 3.2.5 Charge stabilizer/maintenance operation with Onboard supply charger unit - VAS 5900-



#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ [page 2](#)!*

If the battery is fully charged, Onboard supply charger unit -VAS 5900- starts charge maintenance.

- Proceed the same way with the battery charge ⇒ [page 20](#) .

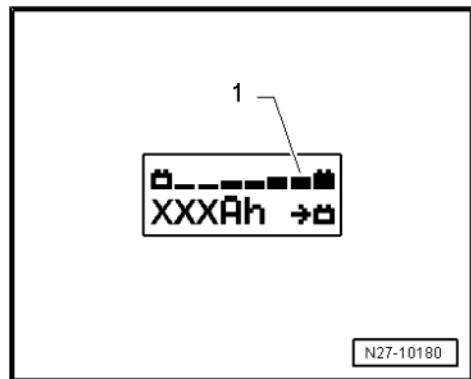


When the charge reaches 100%, the observation hole will display all bars -1-.



Note

- ◆ If the battery is uncharged by a consumer during the stabilizer's operation, Onboard supply charger unit -VAS 5900- automatically ensures the respective recharge.
- ◆ The operation of the stabilizer does not have a time limit.
- ◆ The battery is always ready for use.
- ◆ Pay attention to the instructions for use by the battery manufacturer!

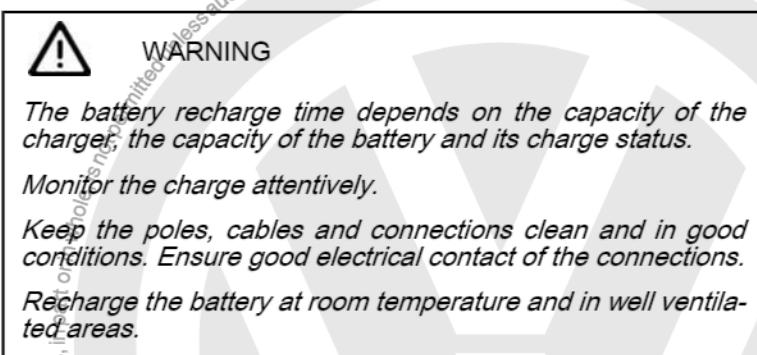


### 3.3 Delphi Battery - charge procedure



Note

The use of quick charge is recommended for batteries manufactured by Delphi. This procedure does not damage the product and results in a faster process.



#### 3.3.1 Fully discharged batteries

Batteries with tension below 11 V take some time to show they are recharging.

The low initial voltage may not activate chargers with protection against reverse charge, even though connections are correct. Read the charger manufacturer's instructions on how to activate the circuit in this situation.

After recharging, test the battery [⇒ page 5](#).

#### 3.3.2 To charge a single battery or for "quick charging"

- Connect the battery to the charger.
- Switch on charger [⇒ page 20](#).
- If possible, adjust the charger to 16 V voltage.
- Adjust the charger to the current maximum adjustment.



### WARNING

*Monitor the charge attentively.*

- *Leakage, gas release through the breather or excessive heating (above 52 °C) shall not occur. If it occurs, reduce the recharge rate (current).*
- *Observe through the observation hole. A permanent green color indicates that the recharge was sufficient to bring the battery to test conditions.*

- Turn the charger off.
- Test the battery [⇒ page 5](#).

### 3.3.3 Charge several batteries - parallel charge



#### Note

*If necessary, perform battery equalization [⇒ page 32](#)*

- Connect the batteries in parallel. The charger shall provide at least 10 A per battery.
- Switch on charger [⇒ page 20](#).
- If possible, adjust the charger to 16 V voltage.
- Adjust the charger to the current maximum adjustment.



### WARNING

*Monitor the charge attentively.*

- *Leakage, gas release through the breather or excessive heating (above 52 °C) shall not occur. If it occurs, reduce the recharge rate (current).*
- *Observe through the observation hole. A permanent green color indicates that the recharge was sufficient to bring the battery to test conditions.*

- Turn the charger off.
- Test the batteries [⇒ page 5](#).
- Proceed with the recharge of batteries that still are discharged and that show dark color on the observation hole.
- Only interrupt the charge after reaching the time set for the charge of this group of batteries.



### 3.3.4 Charge several batteries - Series charging or “slow charging”

#### Note

- ◆ For recharge in series it is important to install batteries of the same capacity and charge status (through equalization) on the same circuit, since the current will be the same for all.
- ◆ If necessary, perform battery equalization, [⇒ page 32](#).

- Connect the batteries in series.
- Switch on charger [⇒ page 20](#).
- Adjust the charger to the current maximum adjustment.



#### WARNING

Monitor the charge attentively.

- Leakage, gas release through the breather or excessive heating (above 52 °C) shall not occur. If it occurs, reduce the recharge rate (current).
- Observe through the observation hole. A permanent green color indicates that the recharge was sufficient to bring the battery to test conditions.

- Turn the charger off.
- Remove the batteries and test them [⇒ page 5](#).
- Proceed with the recharge of batteries that are still discharges and that show dark color on the observation hole.



#### DANGER!

- ◆ During recharge in series, tensions are added and there is a risk of electric shocks.
- ◆ Cables and connectors shall be carefully handled.

### 3.3.5 Battery equalization

The battery equalization shall be performed with batteries that have a difference of 0.10 V or more one to another. They should be connected in parallel for at least 12 h prior to the charge, regardless of the number of parts. This equalization is more efficient when batteries are similar in capacity.

#### Note

Batteries with less than 11 V do not require equalization, since they are considered with 0% charge status.



### 3.4 Fully discharged batteries



#### WARNING

*Risk of injuries! Observe safety warnings and instructions  
⇒ page 2!*

A battery is considered "fully uncharged" when its voltage at rest is below 12.2 V.



#### Caution

- ◆ Fully discharged batteries sulfate prematurely.
- ◆ Sulphate batteries can not be reused.



#### Note

- ◆ Batteries which have not been used for a long time self-discharge, e.g. those in stored vehicles.
- ◆ In fully discharged batteries, the electrolyte (mixture of water and sulphuric acid) is almost exclusively composed by water, once the acid content rate is reduced.
- ◆ Fully uncharged batteries sulfate; that is, the entire battery plate surface hardens.
- ◆ Fully discharged batteries which are recharged immediately after its discharge do not sulfate.
- ◆ If these batteries are not recharged, the plates continue hardening and recharge capacity is reduced. Therefore, the battery power is also reduced.

- Check the battery's resting voltage ⇒ page 10 .
- Charge the battery:

Charge the battery with Onboard supply charger unit -VAS 5095A- ⇒ page 16 .

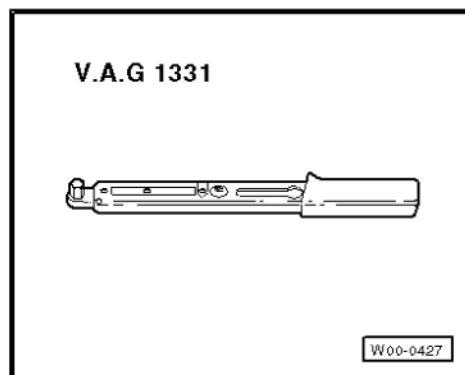
Charge the battery with Onboard supply charger unit -VAS 5900- ⇒ page 20 .



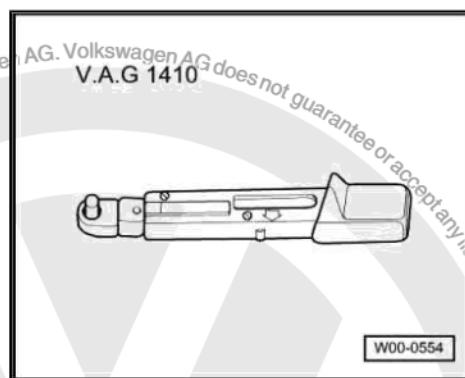
## 4 Battery -A- - Disconnect and connect

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-



- ◆ Torque wrench - 4 to 20 Nm (socket 3/8") -VAG 1410-



### 4.1 Disconnecting



#### WARNING

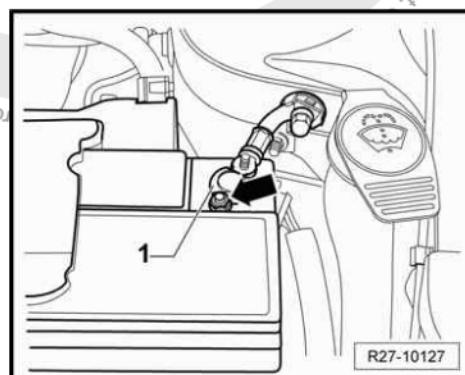
To avoid accident risks, always disconnect first the terminal connected to the negative pole of the Battery -A-.

Attaching the grounding cable for the Battery -A- should not be removed from the vehicle body.

- Turn the ignition and all electric components off and remove the key from the ignition.
- Loosen the attaching nut -arrow- and remove ground cable terminal -1- from the Battery -A- from the negative pole on.

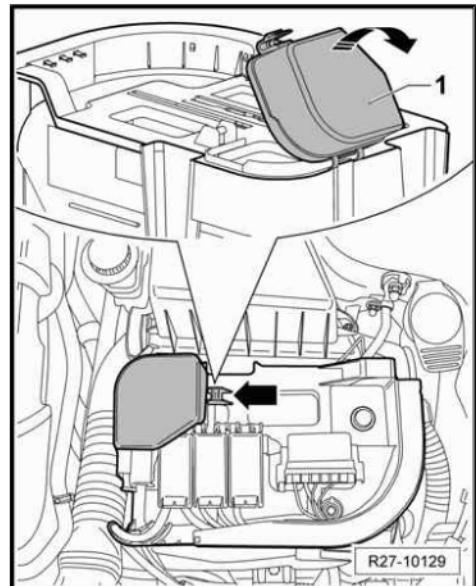
Continuation for:

Fuse box support (version 1):



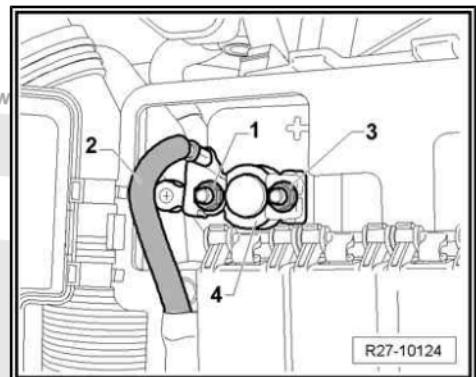


- Press the lock -arrow- and tilt the positive battery pole cover -1- from the Battery -A- .

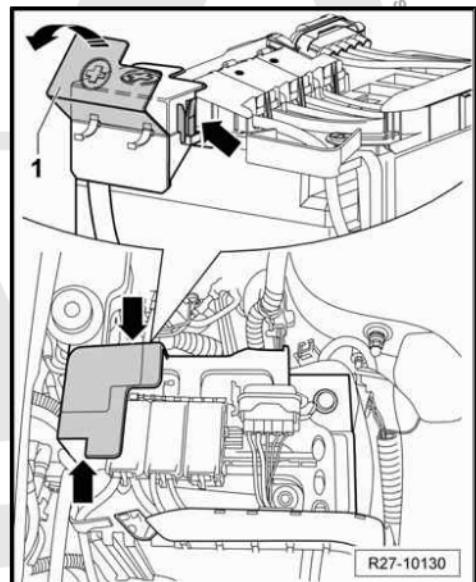


- Loosen the attaching nut -1- and remove terminal of positive cable -2- from fuse box.
- Loosen the attaching nut -3- and remove terminal of positive cable -4- from the Battery -A- .

Fuse box support (version 2):



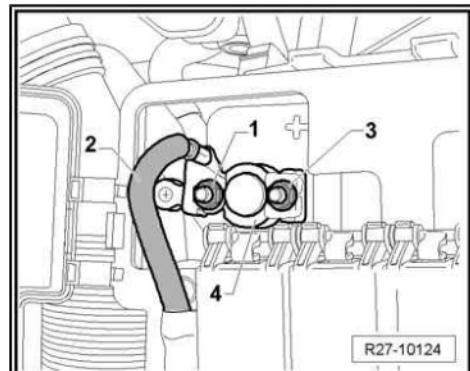
- Press locks -arrows- and tilt the positive battery pole cover -1- from the Battery -A- .



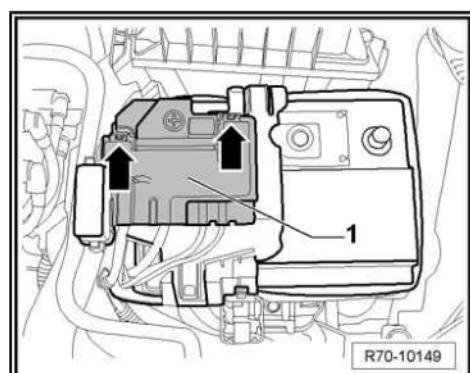


- Loosen the attaching nut -1- and remove terminal of positive cable -2- from fuse box.
- Loosen the attaching nut -3- and remove terminal of positive cable -4- from the Battery -A- .

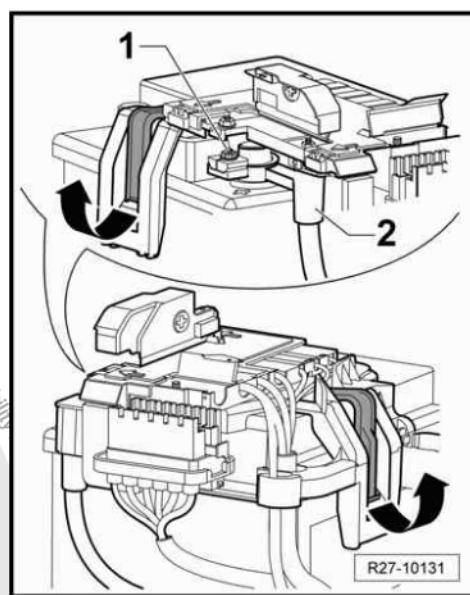
Fuse box support (version 3):



- Press locks -arrows- and tilt the positive battery pole cover upwards -1- from the Battery -A- .



- Loosen the attaching nut -1- from positive cable -2-.
- Loosen the attaching locks from the fuse box, removing them along with the positive cable -2-.



## 4.2 Connect



### Caution

Please observe the notes on the terminal attaching screw of Battery -A- ⇒ General information; Rep. Gr. 27 ; Starter, alternator, battery .



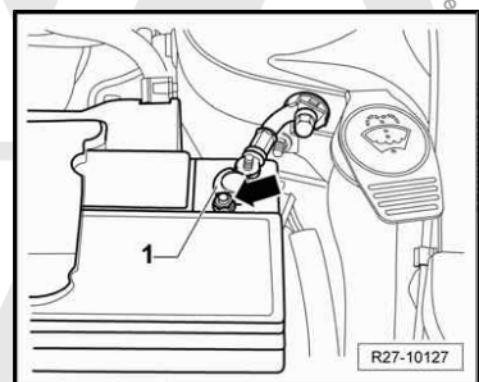
Note

- ◆ The poles of Battery -A- cannot be lubrified.
- ◆ Connect the pole terminals of Battery -A- manually and without forcing them, so as to avoid damages to the case of Battery -A-.
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.
- ◆ Before carrying out measurements, check the external conditions and the connections of the Battery -A- .
- Engage the positive cable terminal to the positive pole of Battery -A- and tighten the attaching nut to the torque of [⇒ page 42](#) .
- Insert the negative cable terminal -1- into the negative pole of the Battery -A- and tighten the fastening nut -arrow- with torque [⇒ page 42](#) .



**WARNING**

*The terminal should be positioned -1- must be placed to ensure dimension -nd- is 25° in order to prevent tension to the negative cable.*

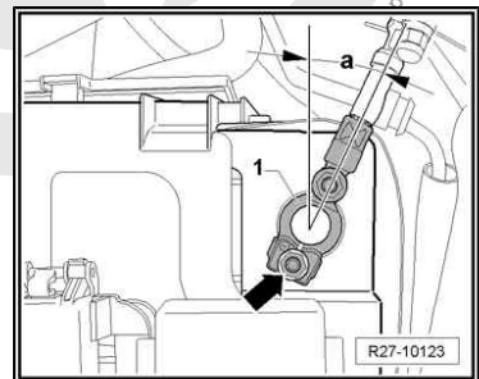


- Tighten the attaching nut -arrow- of the terminal to the torque of [⇒ page 42](#) .



**WARNING**

*If the terminals are not firmly fastened to the Battery -A- poles, the terminal connected to the negative pole of the Battery -A- must be disconnected first, to avoid risk of accidents.*





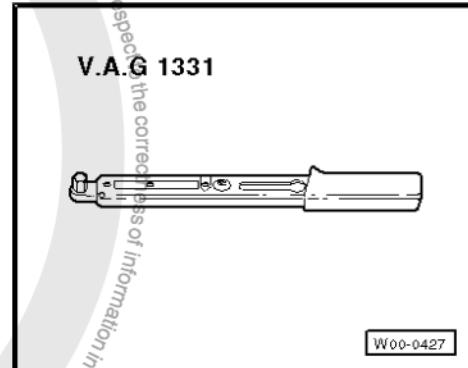
## 5 Battery -A- Remove and install



*To remove the Battery -A- , it is not necessary to disassemble the fuse box, just move it aside, respecting the cable clearance.*

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-



- ◆ Torque wrench - 4 to 20 Nm (socket 3/8") -VAG 1410-



### 5.1 Removal

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [page 34](#) .
- Remove and move away the fuse box until releasing space to remove its support [page 201](#) .

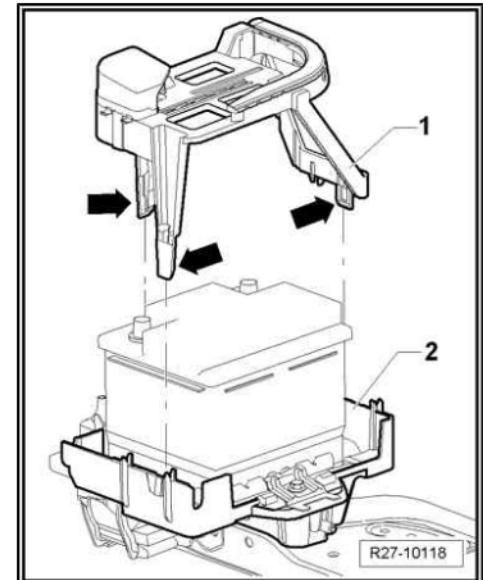


Continuation for:

Fuse box support (version 1):

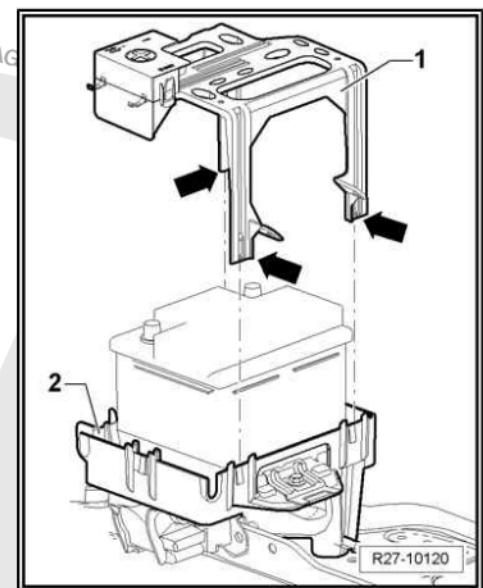
- Release locks -arrows- and remove fuse box support -1- from the console Battery -A- -2-.

Fuse box support (version 2):



- Release locks -arrows- and remove fuse box support -1- from the console Battery -A- -2-.

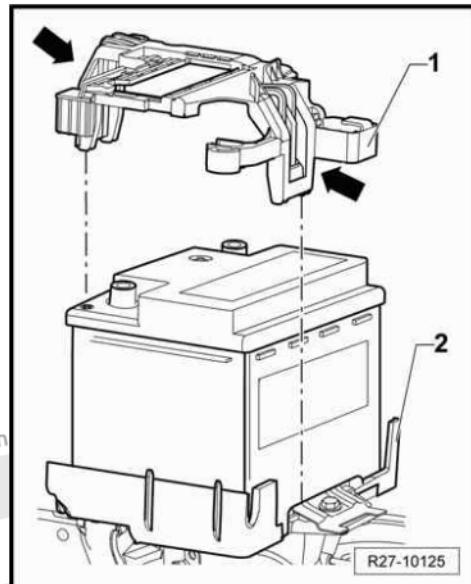
Fuse box support (version 3):



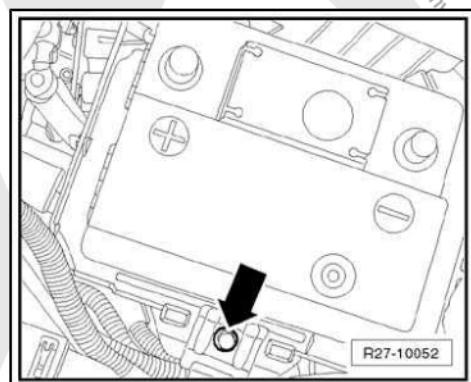


- Release locks -arrows- and remove fuse box support -1- from the console Battery -A- -2-.

Continuation:



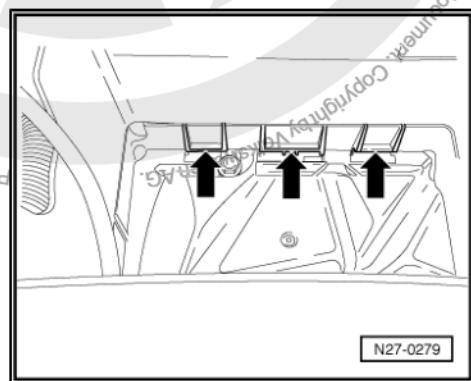
- Loosen and remove the attaching screw -arrow- and the attaching support of the Battery -A- .
- Remove the Battery -A- from its housing.



## 5.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Install Battery -A- so that the Battery -A- base frame fits below the support projections -arrows- of the Battery -A- .



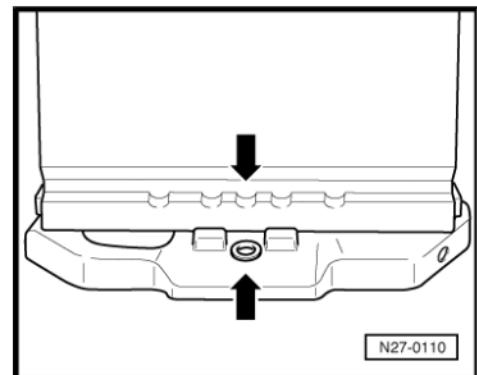


A Battery -A- will be correctly positioned when the central groove of its base is aligned with the hole on the Battery -A- -arrows-.

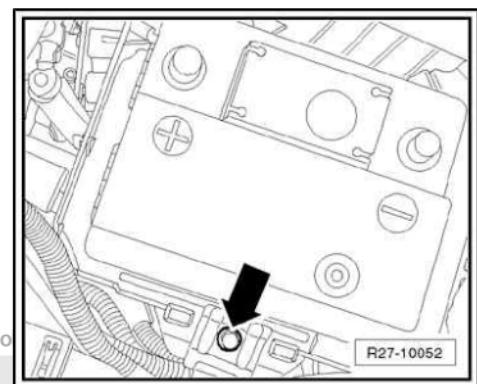


Note

- ◆ The Battery -A- with flexible tube for central degassing, please make sure that the flexible tube is not disconnected. This is the only way the Battery -A- can be freely degassed.
- ◆ With Battery -A- without flexible tube for central degassing, please make sure the opening on the upper cover section is not clogged.



- Install the support and the attaching screw -arrow- from the Battery -A- .
- Tighten the fastening screw -arrow- with torque [page 42](#) .
- Install support and fuse box.
- Connect the Battery -A- [page 34](#) ..
- After installation, check the correct Battery -A- fastening. If the Battery -A- is not firmly fastened, the following may happen:
  - The Battery -A- service life may be reduced due to vibration.
  - Damages to the case of Battery -A- .
  - Safety issues in case of collision.



## 5.3 Console of Battery -A- - Remove and install

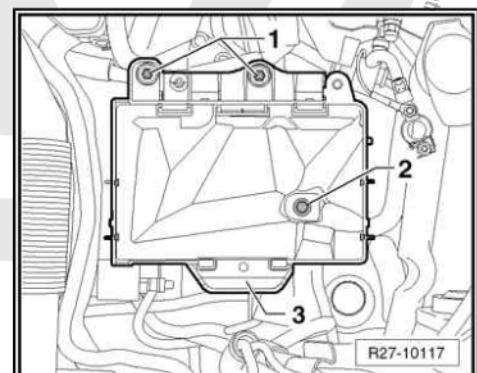
### 5.3.1 Console of Battery -A- console for vehicles with 1.6-liter engine - Remove and install

#### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect and remove the Battery -A- [page 34](#) .
- Remove air filter ⇒ Engine; Rep. Gr. 24 ; Fuel supply - injection system .
- Loosen the fastening nuts -1- and the fastening screw -2- from the console Battery -A- -3-.
- Remove the flexible rubber draining tube from the lower part of the console Battery -A- .
- Remove the console Battery -A- -3- out of its housing.

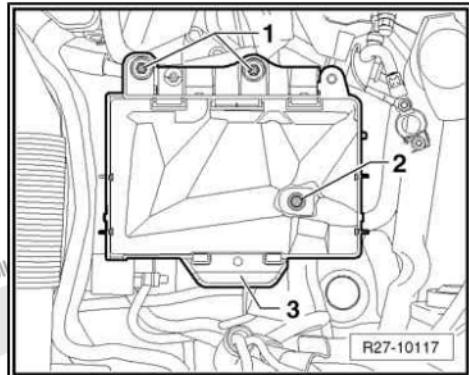
#### Installation:

Install by inverting the removal sequence, paying attention to the following:





- Tighten the fastening nuts -1- and the fastening screw -2- with torque [page 42](#).
- After installing, check correct seating of the Battery -A- on its.
- Connect the Battery -A- [page 34](#).



## 5.4 Tightening torques - Battery

Location	Tightening torque
Terminals to battery poles	$6 \pm 1 \text{ Nm}$
Auxiliary terminal to battery pole terminal (fuse box - version 1 and 2)	$6 \pm 1 \text{ Nm}$
Auxiliary terminal to battery pole terminal (fuse box - version 3)	$9 \pm 1 \text{ Nm}$
Battery console fastening screws and nuts	$16 \pm 2 \text{ Nm}$
Fastening screw of the battery support	$16 \pm 1 \text{ Nm}$



## 6 Starter



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-

V.A.G 1331



W00-0427

- ◆ Torque wrench 40 - 200 Nm -VAG 1332-

V.A.G 1332



W00-0428

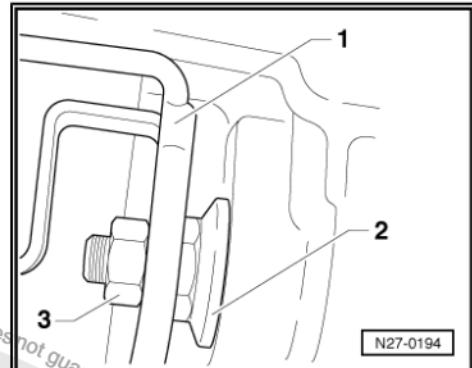
### 6.1 Starter -B- - Remove and install

#### 6.1.1 Removal

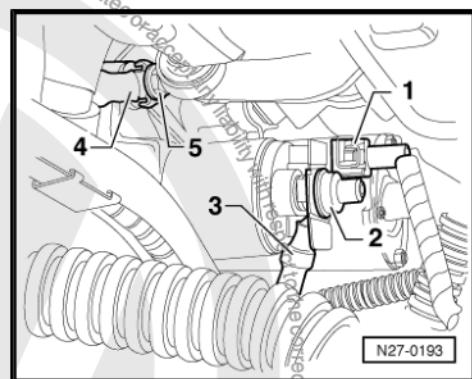
- Turn the ignition and all electric components off and remove the key from the ignition.
- Put vehicle in a lift in order to make the operation easier.
- Disconnect the Battery -A- [⇒ page 34](#) .



- Remove the lower engine noise insulation, if necessary ⇒ Body - external mountings; Rep. Gr. 50 ; Body - Front part .
- Remove transmission selector lever ⇒ Power transmission; Rep. Gr. 34 ; Drive, housing .
- Remove fastening nut-3- under the Starter -B- and remove the cable bracket -1-.
- Remove fixing screws -2- of Starter -B- .



- Disconnect terminal 50 -1- of Starter -B- .
- Remove plastic cover -2- and remove positive cable -3- from the magnetic switch.
- Remove the hexagonal nut -5-.
- Remove Earth Strap -4- and loosen the hexagonal screw.
- Remove the Starter -B- .



## 6.1.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening nuts Starter -B- to the specified torque  
⇒ [page 59](#) .



## 6.2 Starter -B- (Manufactured by Valeo) - Disassemble and assemble

### 1 - Starter -B-

- Remove and install  
[⇒ page 43](#).

### 2 - Lever

### 3 - Mobile core

### 4 - Magnetic key

- Remove and install  
[⇒ page 45](#).

### 5 - Hexagon nut

- 9.5 Nm

### 6 - Starter Starter -B-

### 7 - Screw

- 3.3 Nm

### 8 - Screw

- 6.4 Nm

### 9 - Brush holder

### 10 - Coil (Polar case)

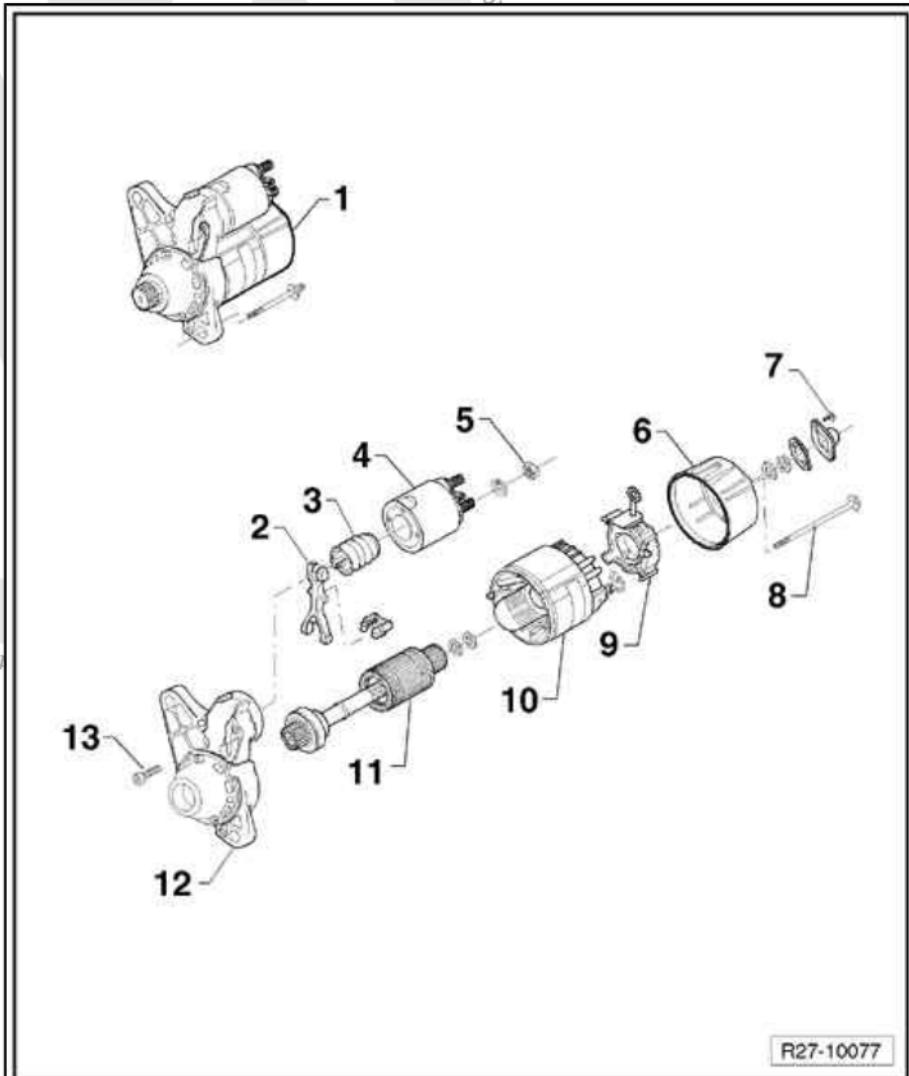
### 11 - Gearing pinion and armature assembly

- Remove and install  
[⇒ page 46](#).

### 12 - Drive bearing

### 13 - Screw

- Used to fasten the magnetic key.
- 3.75 Nm



R27-10077

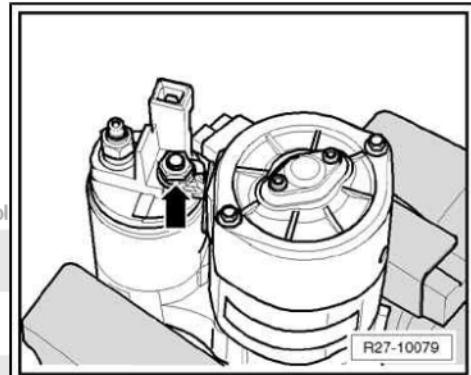
### 6.2.1 Magnetic key - remove and install

#### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove the Starter -B- [⇒ page 43](#).



- Loosen the attaching nut -arrow- and disconnect the brush cable.



- Remove the attaching screws -arrows- for the magnetic key.



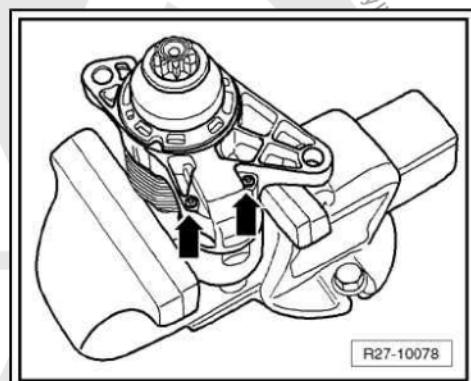
*Use a good quality wrench. If removal is difficult, hit screw heads sharply a few times with a pointed punch.*

- Remove magnetic key.

Installation:

Install by inverting the removal sequence, paying attention to the following:

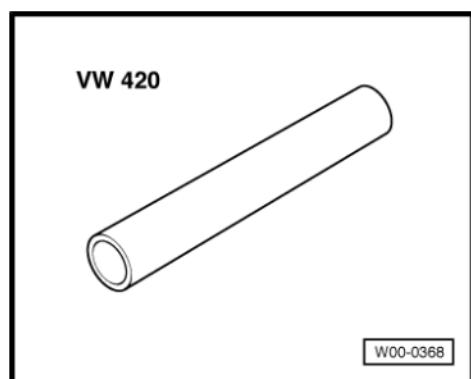
- Install the spring and magnetic switch and fasten the magnetic switch screws (3.7 Nm).
- Connect the brush cable by fastening it with the nut tightened to (9.5 Nm).
- Install the Starter -B- [page 43](#).



### 6.2.2 Armature and gearing pinion - remove and install

Special tools and workshop equipment required

- ◆ Pressure tube -VW 420-

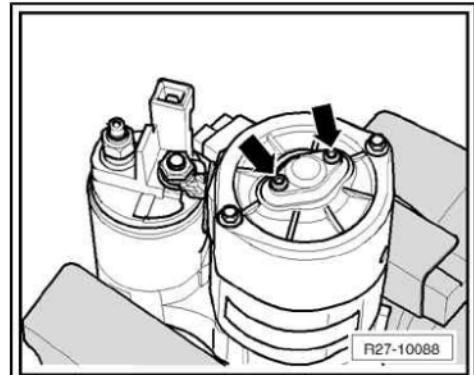


Removal:

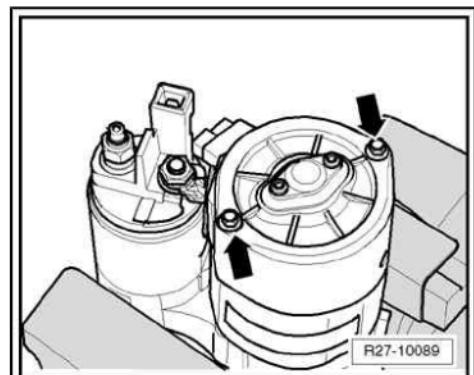
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [page 34](#).
- Remove the Starter -B- [page 43](#).
- Remove magnetic key [page 45](#).



- Loosen the fastening screws -arrows- from the rear cover of the shaft end.
- Remove lock washer, flat washer, and sealing ring.



- Remove the attaching screws -arrows- and remove the cover.



- Using the Pressure tube -VW 420- as a guide, slide the brush holder -arrow- and remove it from the armature.



*Handle carefully, because the springs may jump out of the brush holder.*

- Remove the polar case by pulling it out.



*Please be very careful with your fingers, because the armature is strongly pulled by the magnets.*

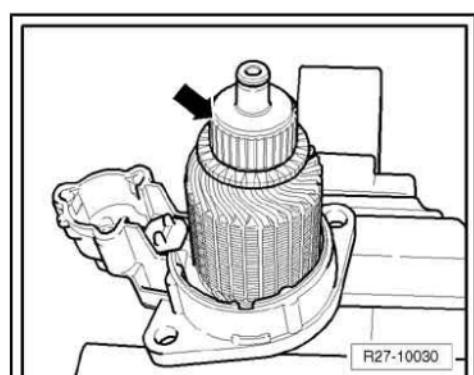
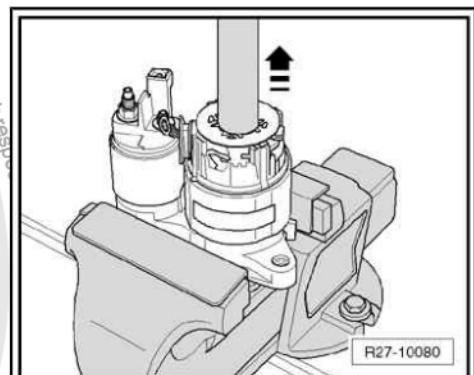
- Remove the armature and the gearing pinion.

**Installation:**

- Fit the armature -arrow- in the activation bearing, together with the operating rod and the rubber stop.
- Fit the polar case.

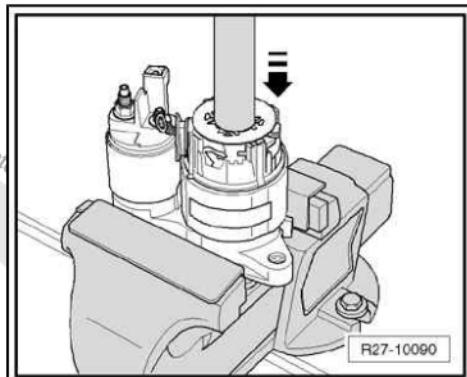


*Please be very careful with your fingers, because the armature is strongly pulled by the magnets.*





- Fit the brush holder using the Pressure tube -VW 420- and sliding it toward the rotor -arrow- and then removing the tool.

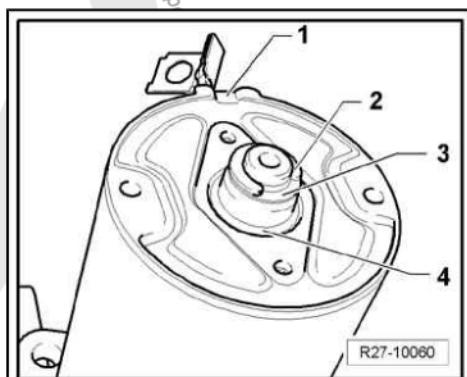


- Install rear cover, paying attention to the correct position of tab and the cover screw holes.
- Position cable seal rubber on case cover -1-.
- Fit seal -4-, plain washer -3- and circlip -2- on armature shaft.

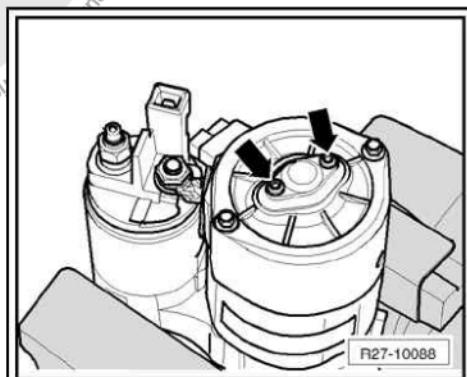


Note

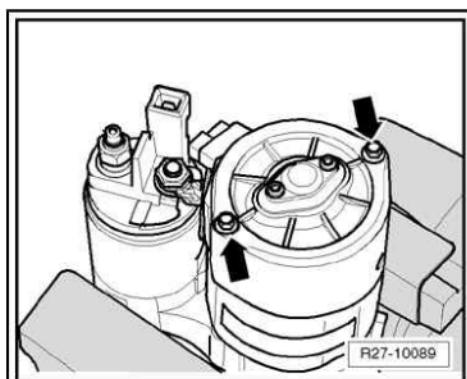
*If you are unable to easily fit lock washer, pull shaft a little outwards.*



- Install the rear shaft end cover and tighten the screws -arrows- with a torque of 3.3 Nm.



- Install the fastening screws -arrows- of the polar case cover cap applying a 6.4-Nm torque.
- Install magnetic key [⇒ page 45](#) .
- Install the Starter -B- [⇒ page 43](#) .





## 6.3 Starter -B- (Manufactured by Bosch) - disassemble and assemble

### 1 - Starter -B-

- Remove and Install  
[⇒ page 43](#).

### 2 - Magnetic key

- Remove and install  
[⇒ page 49](#).

### 3 - Hexagon nut

- 8 Nm

### 4 - Operating rod

### 5 - Rubber stopper

### 6 - Gearing pinion

- Remove and install  
 (Fastened on the armature shaft) [⇒ page 53](#).

### 7 - Armature

- Remove and install  
[⇒ page 51](#).

### 8 - Screw

- 2 units
- 2 Nm

### 9 - Shaft cover (armature)

### 10 - Screw

- 2 units
- 6 Nm

### 11 - Starter Starter -B-

### 12 - Brush holder

### 13 - Coil (Polar case)

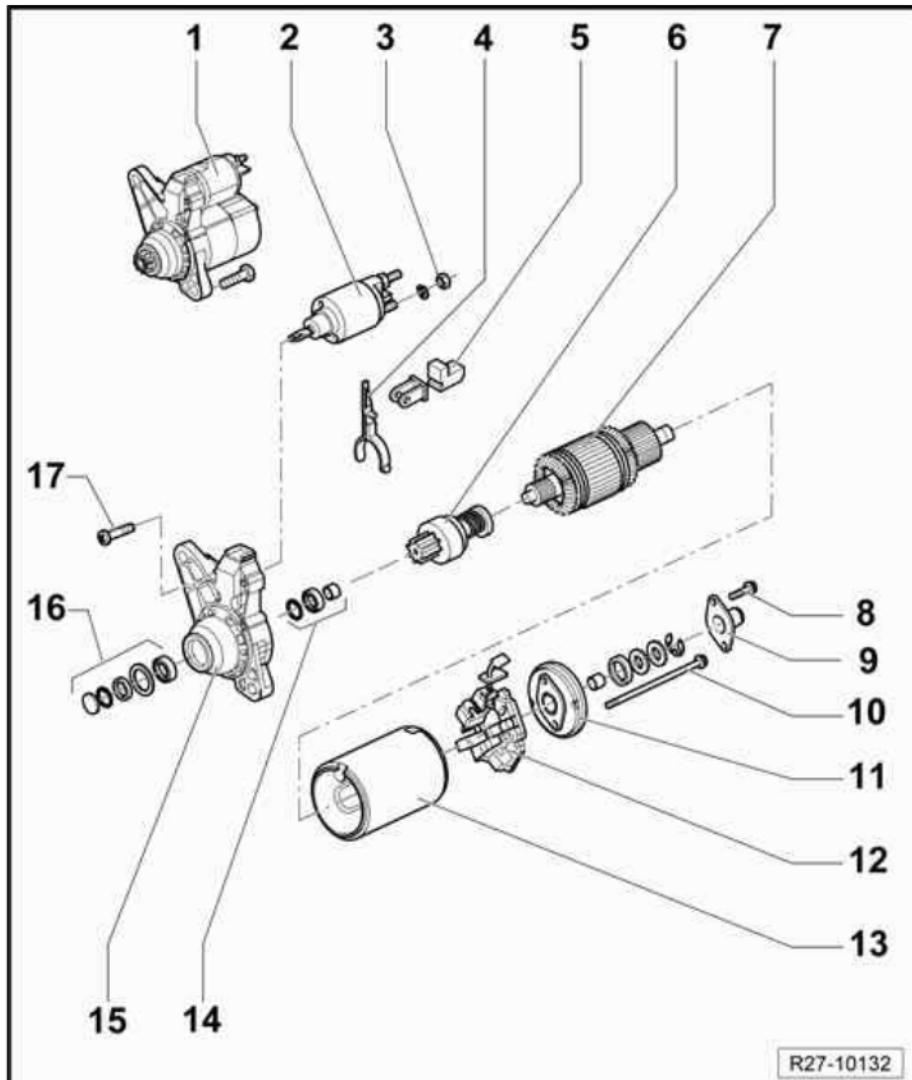
### 14 - Circlip and capsule

### 15 - Drive bearing

### 16 - Repair set (metal cover, bearing bushing, sealing ring)

### 17 - Screw

- Used to fasten the magnetic key.
- 7 Nm



R27-10132

### 6.3.1 Magnetic key - remove and install

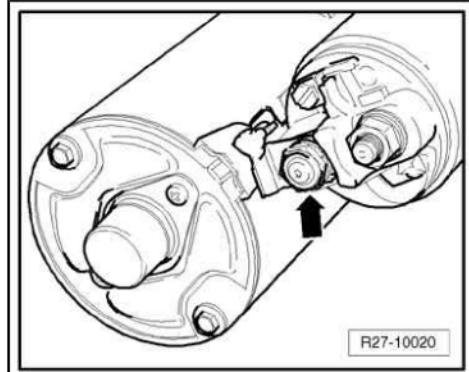
#### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove the Starter -B- [⇒ page 43](#).

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- Remove fastening nut -arrow- and disconnect the brush cable.



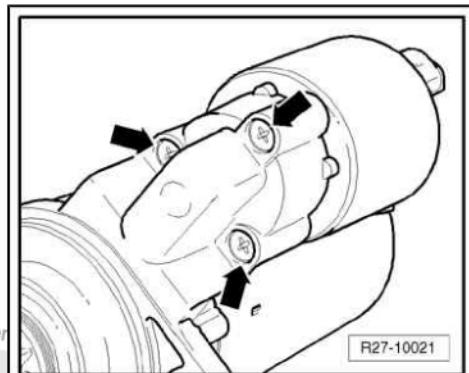
- Remove the attaching screws -arrows- for the magnetic key.



Note

*Please use a good quality cross-slotted screwdriver. If removal is difficult, hit screw heads sharply a few times with a pointed punch.*

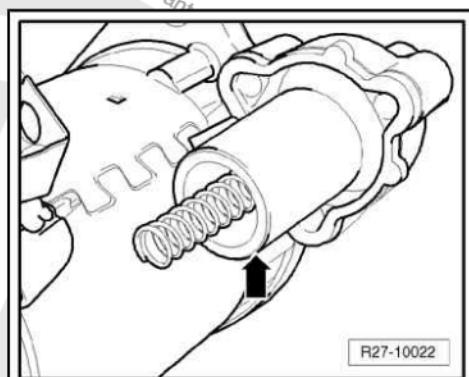
- Remove magnetic key.



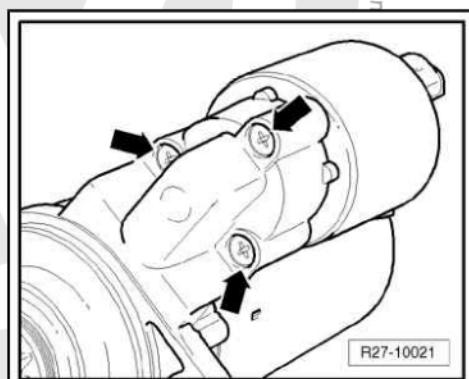
- Remove the spring and the rod operating plunger -arrow-.

Installation:

- Install plunger onto operating rod.

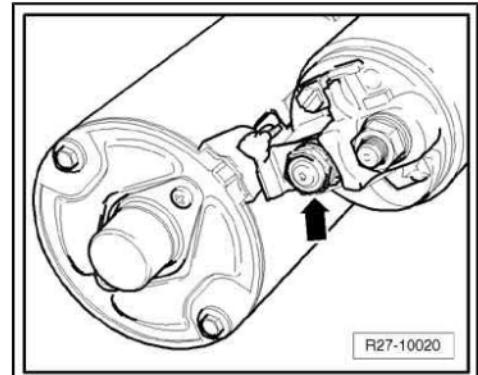


- Install the spring and the magnetic switch and tighten fastening screws -arrows- with a torque of 7 Nm.





- Connect the brush cable and tighten fastening nut -arrow- with a torque of 8 Nm.
- Install the Starter -B- [⇒ page 43](#).

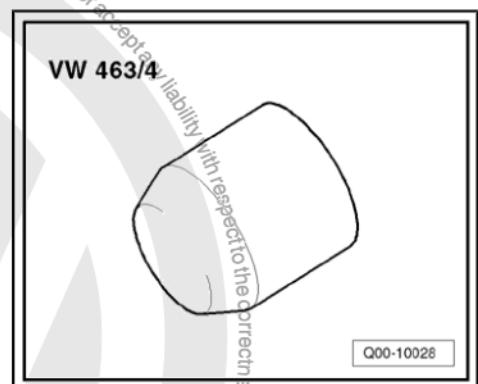


R27-10020

### 6.3.2 Armature - remove and install

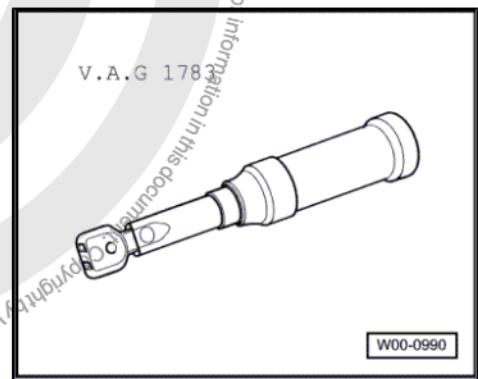
Special tools and workshop equipment required

- ◆ Device -VW 463/4-



Q00-10028

- ◆ Torque wrench 2 to 10 Nm -VAG 1783- .



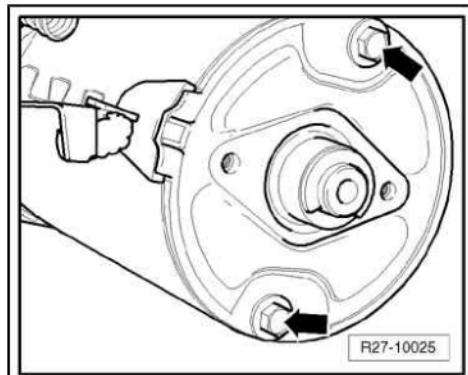
W00-0990

#### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove the Starter -B- [⇒ page 43](#).
- Remove magnetic key [⇒ page 45](#).
- Remove shaft end rear cover, locking washer, plain washer, and sealing ring.



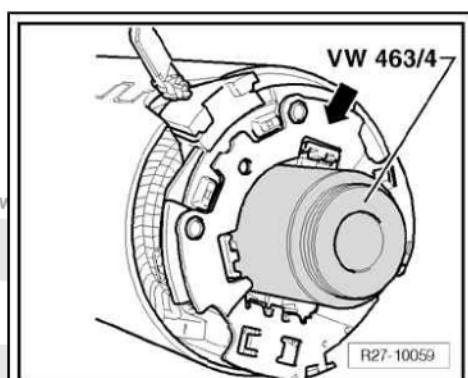
- Remove the attaching screws -arrows- from the polar case cover cap.



- Using the Device -VW 463/4- as a guide, slide the brush holder -arrow- and remove it from the armature.
- Remove the armature from the polar case by pulling it.



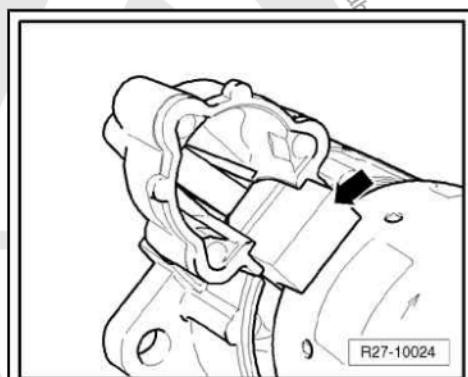
*Please be very careful with your fingers, because the armature is strongly pulled by the magnets.*



- Remove the rubber stopper -arrow-.

Installation:

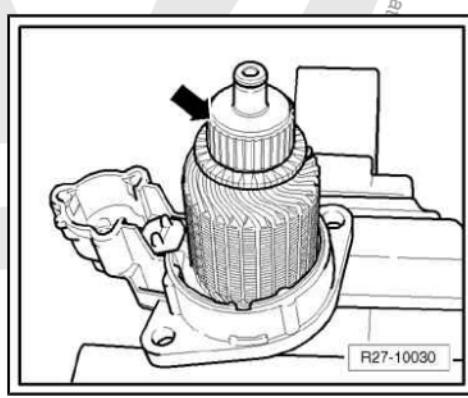
- Install the armature in the activation bearing and in the polar case.



- Fit the armature -arrow- in the activation bearing, together with the operating rod and the rubber stopper.

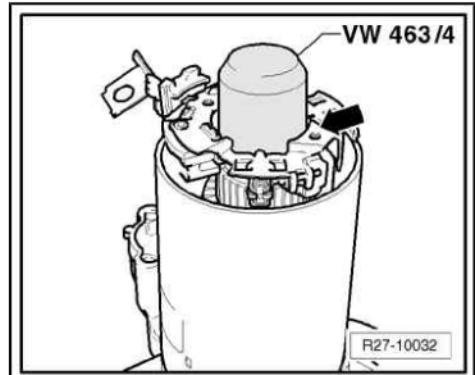


*Please be very careful with your fingers, because the armature is strongly pulled by the magnets.*





- Fit the brush holder -arrow- with a pair of Device -VW 463/4- sliding it toward the rotor, and then removing the tool.

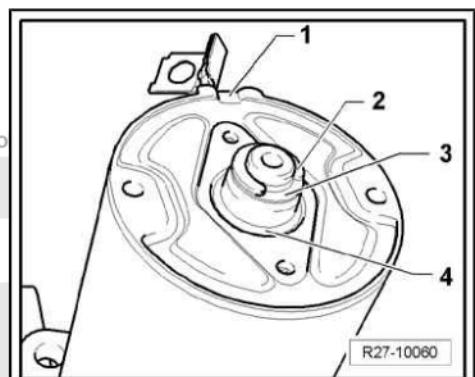


- Position housing cable seal rubber -1-.
- Install rear cover, paying attention to the correct position of tab and the cover screw holes.
- Fit seal -4-, plain washer -3- and circlip -2- on armature shaft.

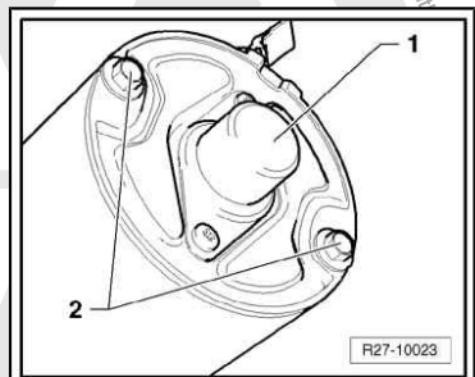


**Note**

*If you are unable to easily fit lock washer, pull shaft a little outwards.*



- Install rear shaft end cover -1- and tighten the screws with the torque of 2-Nm.
- Install and tighten fastening screws -2- of the polar case cover cap applying a 6-Nm torque.
- Install magnetic key [⇒ page 49](#).
- Install the Starter -B- [⇒ page 43](#).



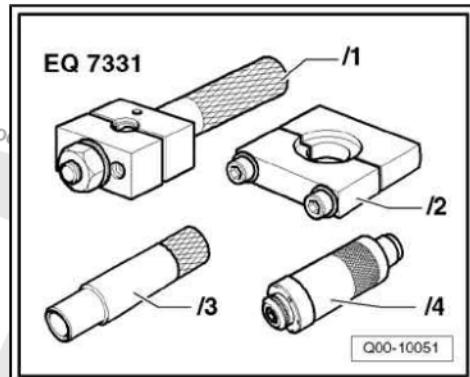
### 6.3.3 Gearing pinion (fastened on armature shaft) - Remove and install

Special tools and workshop equipment required

- ♦ Mounting device -EQ-7331/1-
- ♦ Assembly tool -EQ-7331/2-
- ♦ Lock puller -EQ-7331/3-



◆ Pressing Tool -EQ-7331/4-



Removal:

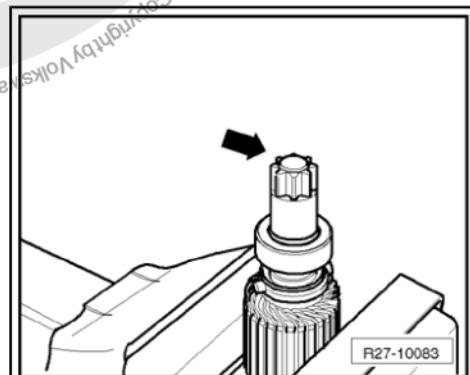
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove the Starter -B- [⇒ page 43](#).
- Remove the armature [⇒ page 51](#).



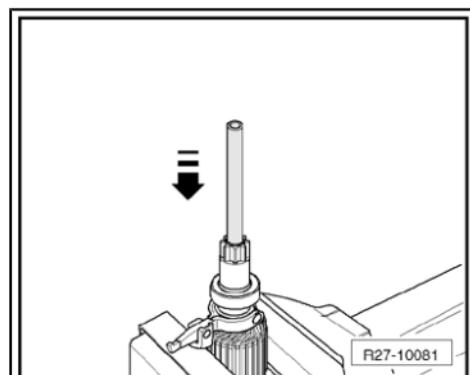
**WARNING**

*When setting the armature on the vise, please do be careful not to damage the magnets. Should any damage occur, then the armature must be replaced.*

- Remove metallic cover -arrow- with help of an Mounting device -EQ-7331/1- .



- Lower the attaching capsule of the circlip by using a tube with diameter (13 mm)-arrow-, by tapping slightly on the tube with a rubber or wooden hammer until displacing the capsule from the circlip.
- By using pliers or a screwdriver, remove the circlip and capsule from the armature shaft.





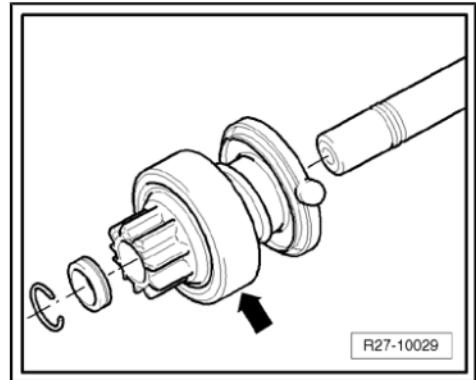
- Remove the gearing pinion -arrow- from the armature shaft.

Installation:



#### WARNING

*Whenever performing the repair at the gearing pinion, replace the following components: Metallic cover, circlip and capsule.*



- Secure slightly the armature on the vise.



#### WARNING

*When setting the armature on the vise, please do be careful not to damage the magnets. Should any damage occur, then the armature must be replaced.*

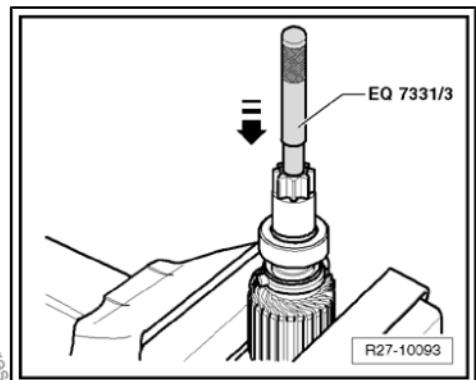
- Install the gearing pinion in the armature shaft.
- Fit the stop capsule on the armature shaft.



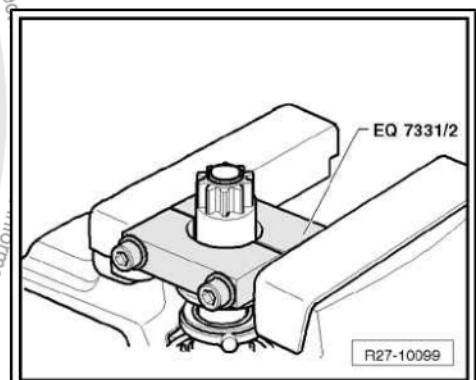
#### Note

*Observe that the stop cap has a assembling side.*

- Mount the circlip on shaft.
- Fit circlip on the shaft notch by using the Lock puller - EQ-7331/3- and tapping slightly with a hammer towards -arrow-.



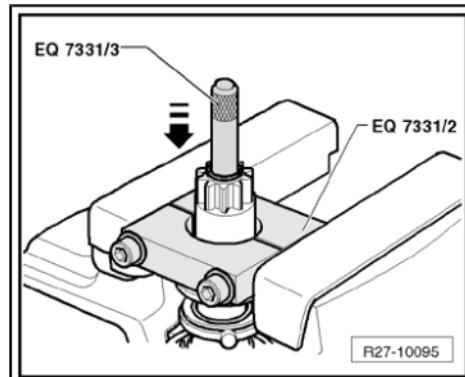
- Assemble the Assembly tool -EQ-7331/3- on the gearing pinion and secure the assembly on the vise.



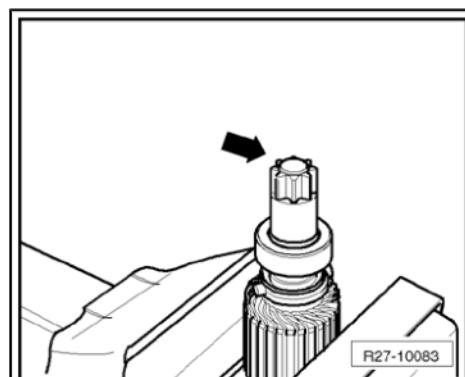
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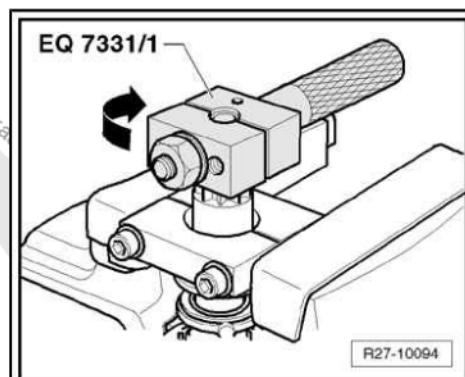
- To encapsulate the circlip in the attaching capsule, use the Lock puller -EQ-7331/2- -3- and tap slightly with a hammer towards -arrow- until fitting.



- Install the metallic cover -arrow-.



- Use the Mounting device -EQ-7331/1- -1- to drive the metallic cover on the gearing pinion.
- Install the armature [⇒ page 51](#).

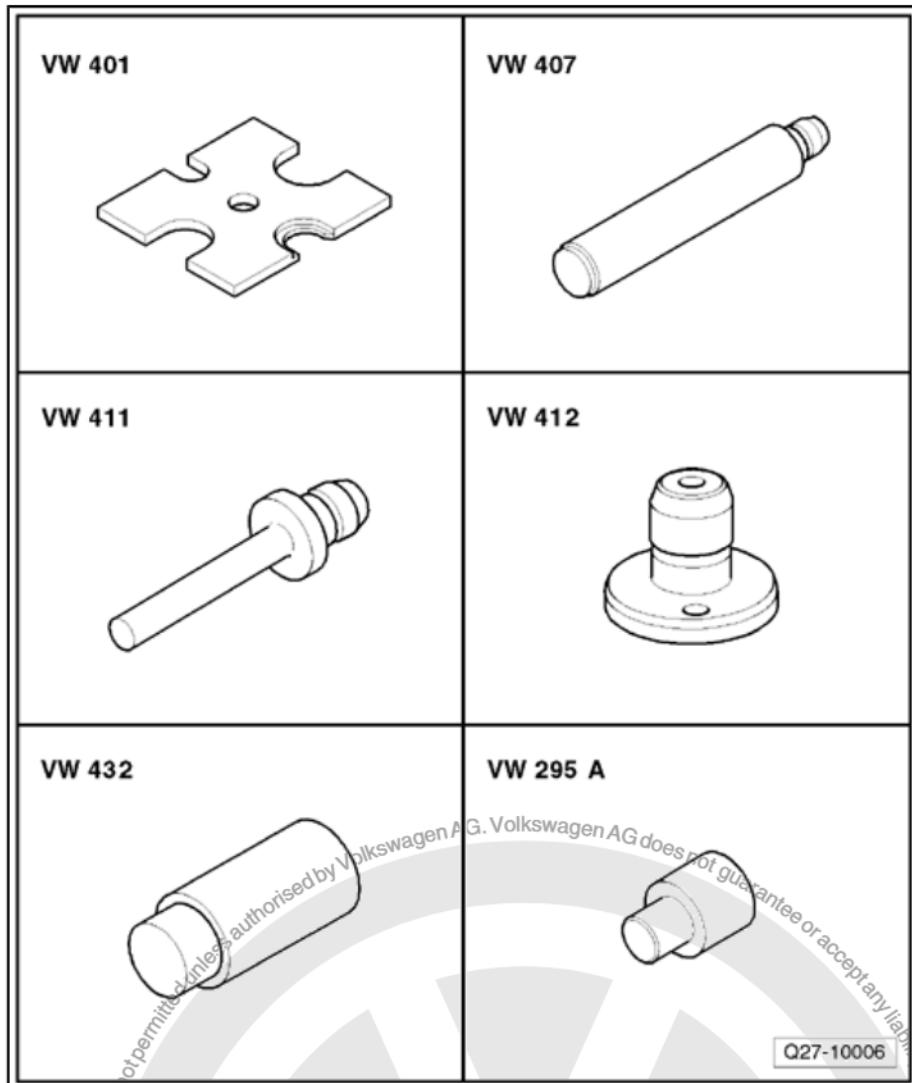




### 6.3.4 Bearing Bushing - Remove and install

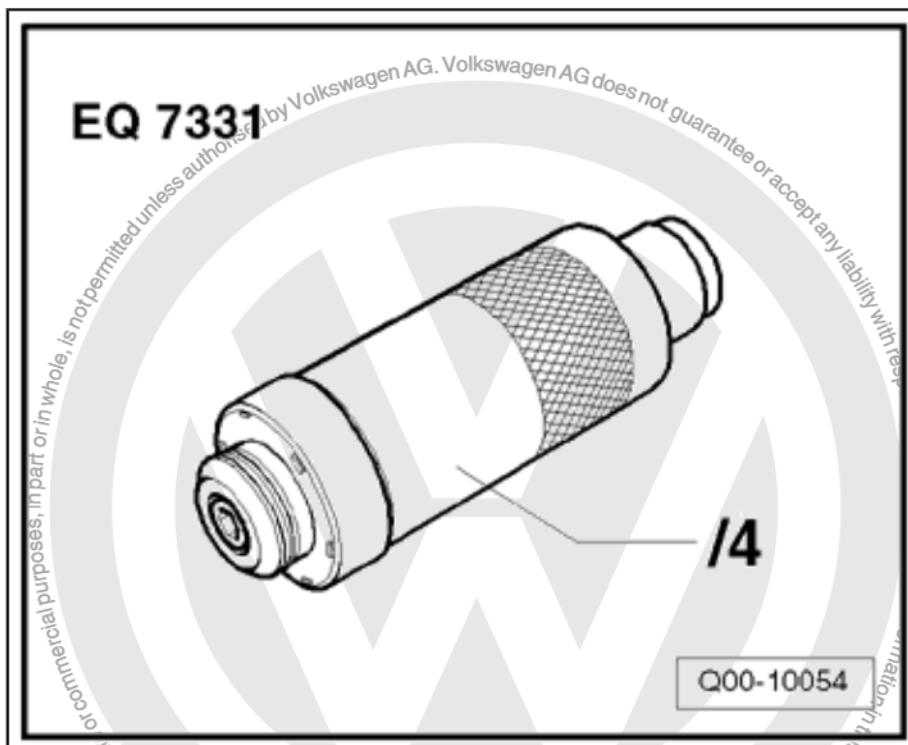
Special tools and workshop equipment required

- ◆ Thrust plate -VW 401-
- ◆ Pressure pin -VW 407-
- ◆ Pressure pin -VW 411-
- ◆ Pressure Disc -VW 412-
- ◆ Thrust pad -VW 432-
- ◆ Basis -VW 295A-





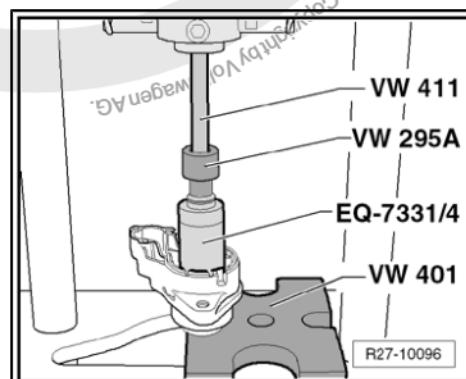
◆ Pressing Tool -EQ7331/4-



Bearing bushing removal:

- Support case on the Thrust plate -VW 401- and remove the bearing bushing with circlip.

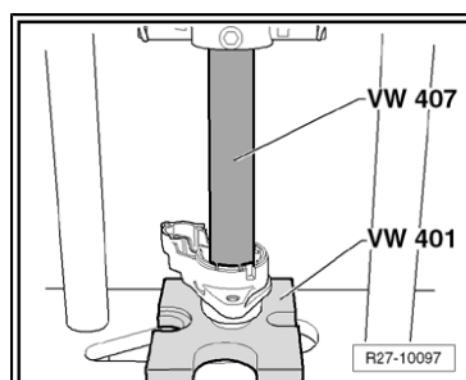
Bearing bushing installation:



- Install the bushing on case to the stopper, by using the Pressure pin -VW 407- .

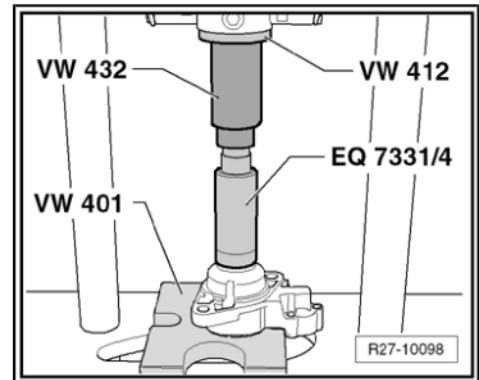
Sealing ring installation:

- Fit sealing ring on case.





- Support case on the Thrust plate -VW 401- and re-drive by using the Pressing Tool -EQ-7331/4- .



## 6.4 Tightening torques - Starter

Location	Tightening torque	
Starter to transmission	M12	80 Nm
Starter to transmission	M10	40 Nm
Earth strap	M8	15 Nm
Cable support	M8	15 Nm
Positive cable to electromagnetic switch	M8	15 Nm





## 7 Alternator



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- page 34.*

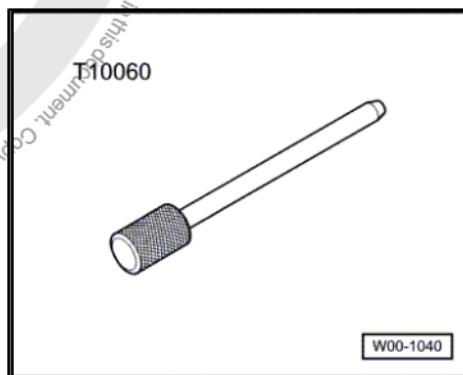


### Note

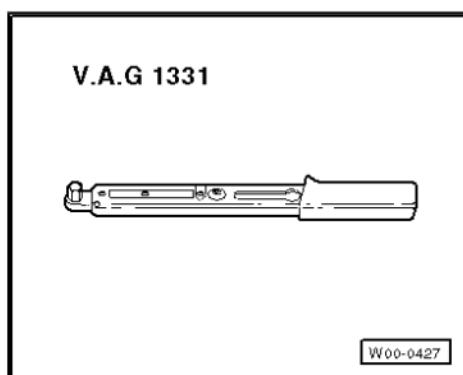
- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Check Generator (Alternator) -C- : ⇒ Manual "Current circuit diagram", Fault finding at the Electrical System and Installation locations .
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Pin -T 10060A-



- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-





## 7.1 Generator (Alternator) -C- - Attaching cable (B+)

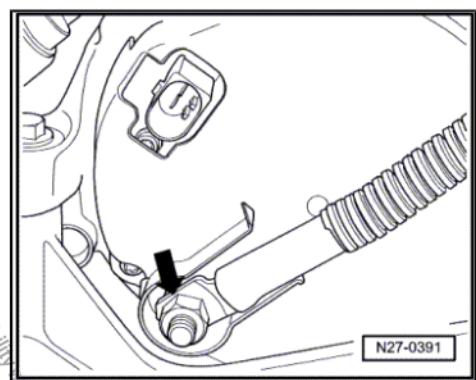


### Caution

If the (B+) cable is not tightened to the torque specified, there are the following hazards:

- A Battery -A- is not completely charged.
- Total collapse of the vehicle electrical/electronic system (car damaged).
- There could be a fire hazard due to production of sparks.
- Failures due to excessive charge in electronic components and control units.

Observe the tightening torque of the attaching nut -arrow- of the cable (B+) [page 73](#).



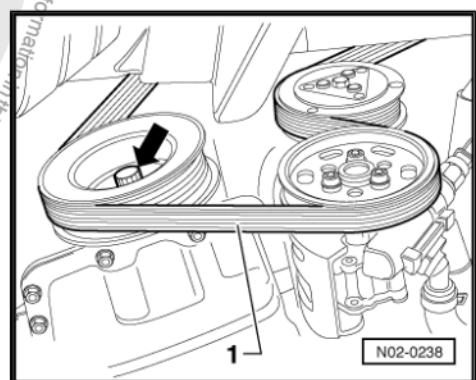
## 7.2 Poly-V Belt of Generator (Alternator) -C- - Check



### Note

If failures are detected, the Poly-V belt must be replaced, to prevent operation failures or anomalies.

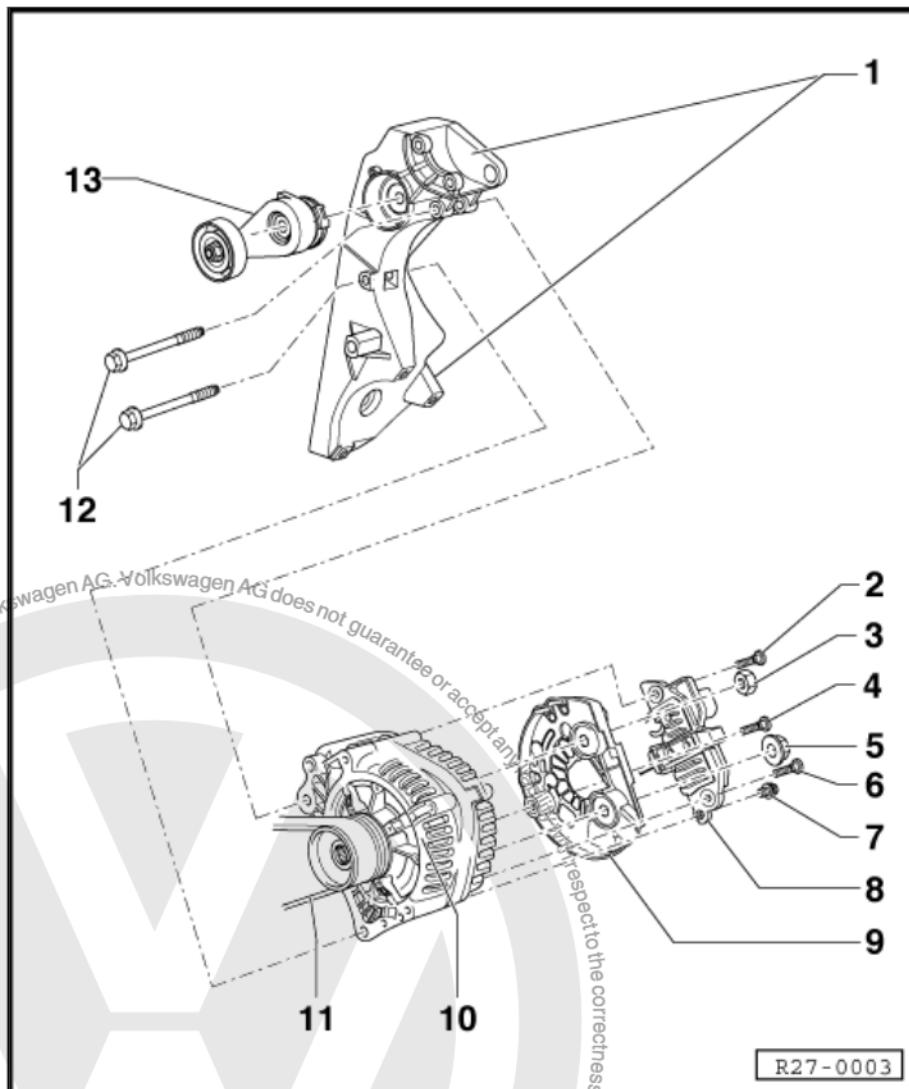
- Turn engine manually using the crankshaft pulley -arrow-.
- Lift the vehicle and check the Poly-V belt -1- for:
  - ◆ Cracks in the lower section (slots, central fractures, transversal fractures)
  - ◆ Layer separation (cover layer, cords)
  - ◆ Fissure on lower section
  - ◆ Fraying of cord strands
  - ◆ Worn sides (material wearing, frayed sides, side hardening - glassy sides), surface cracks.
  - ◆ Contact with oil and grease.





## 7.3 Alternator with Poly-V belt (all motorizations, except CCRA, CFZA) - assembly overview

- 1 - Support
- 2 - Crosshead screw
- 3 - Hexagon nut  
□ M 8
- 4 - Crosshead screw
- 5 - Hexagon nut  
□ M 8
- 6 - Crosshead screw
- 7 - Crosshead screw
- 8 - Voltage regulator  
□ Remove and install  
⇒ [page 69](#)
- 9 - Protection cover
- 10 - Alternator  
□ Tightening torque for  
cable B+ ⇒ [page 63](#)  
□ Check the carbon  
brushes ⇒ [page 62](#)
- 11 - Poly-V belt  
□ Remove and install  
⇒ [page 63](#)
- 12 - Hexagon screws  
□ M8×90 mm  
□ 23 Nm
- 13 - Belt tensioner

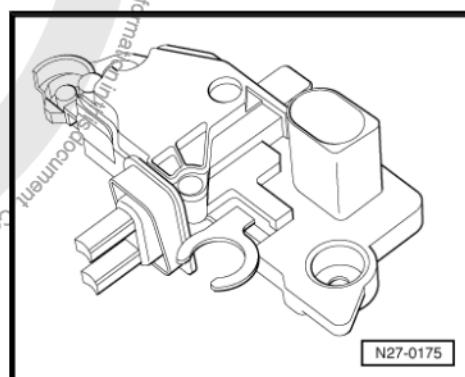


### Carbon brushes - check

Length of the new carbon brushes = 12 mm

Wear limit = 5mm

Carbon brush tolerance, one to another = 1 mm





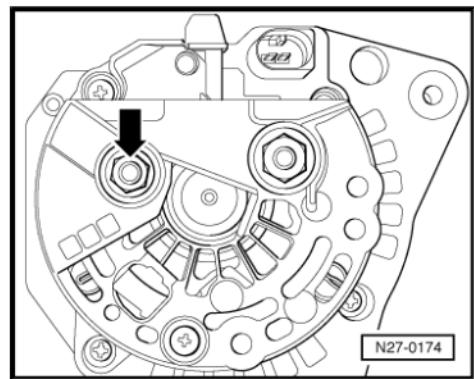
### Cable B+ - Tightening torque

Respect the tightening torque of the securing nut for cable B+ -arrow- [⇒ page 73](#).



#### Note

- ◆ *The connection to the cable + is marked with B+ on the compact alternator!*
- ◆ *If B+ cable is not tightened with the specified torque, the following is in danger:*
- ◆ *The battery is not fully charged.*
- ◆ *Total collapse of the vehicle electrical/electronic system (car damaged).*
- ◆ *There could be a fire hazard due to production of sparks.*
- ◆ *Failures due to excessive charge in electronic components and control units.*



## 7.4 Alternator with Poly-V belt (all motorizations, except CCRA, CFZA) - remove and install

### 7.4.1 Removal

- Turn the ignition and all electrical consumers off.
- Disconnect battery [⇒ page 34](#).



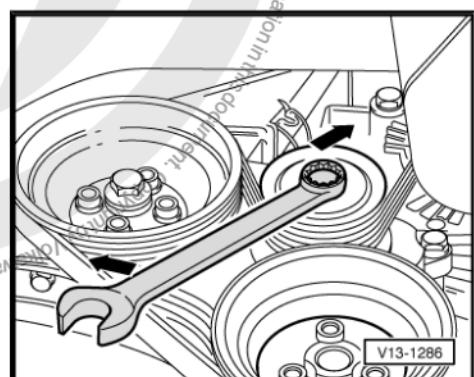
#### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap.*
- ◆ *When the battery is reconnected, check the operation of the vehicle electrical system (radio, clock and electric door and window locks, etc.) according to the Workshop Manual and/or instructions for use.*
- If necessary, remove insulation tray ⇒ Body - external mountings; Rep. Gr. 50 ; Noise insulation - remove and install .
- Mark the turning direction of the Poly V belt.

#### Gasoline-fueled vehicles

- To release the Poly-V belt, turn the belt tensioner towards the -arrow-, with the 16 mm screwdriver .
- Remove the Poly-V belt.

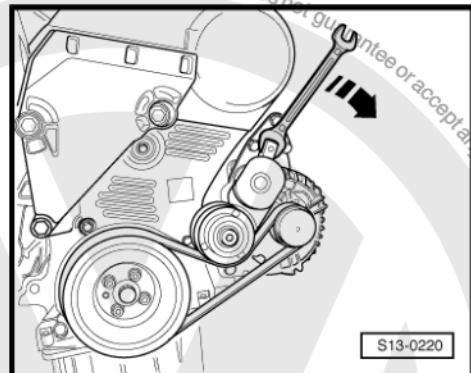
#### Vehicles without air conditioning





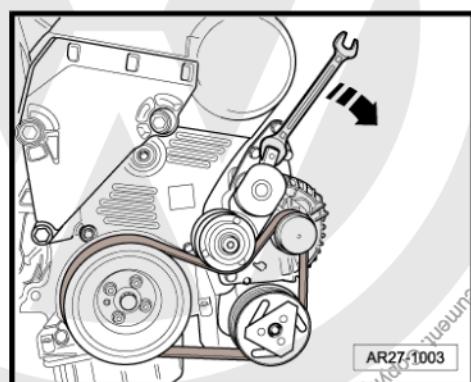
- Turn the tensioning element towards the -arrow- to loosen the Poly-V belt.
- Lock the tensor with Pin -T 10060- .
- Remove the Poly-V belt.

Vehicles with air conditioning

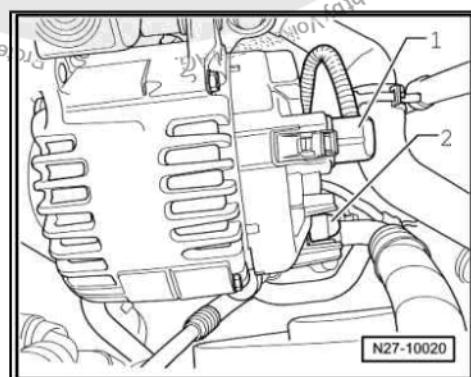


- Turn the tensioning element towards the -arrow- to loosen the Poly-V belt.
- Lock the tensor with Pin -T 10060- .
- Remove the Poly-V belt.

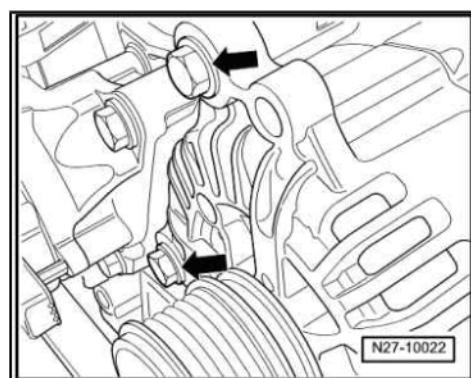
Continued for all vehicles



- Pull off connector -2- and release the terminal of cable B+ -1-.

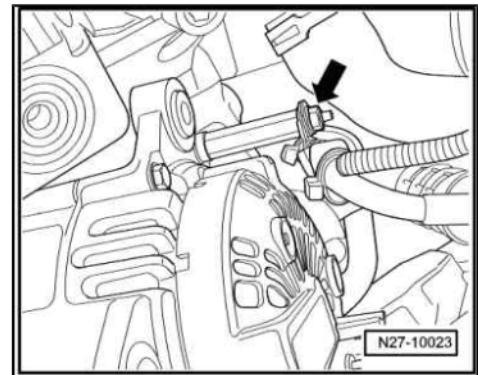


- Loosen the stopper attaching screws -arrows-.





- Release the support cables -arrow- for the alternator.
- Remove the alternator.



## 7.4.2 Installation

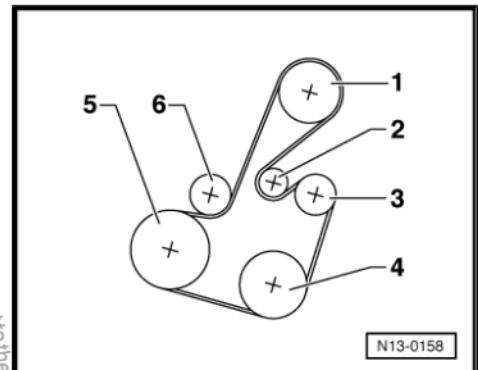
Install by inverting the removal sequence, paying attention to the following:

- First assemble the Poly-V belt to the crankshaft pulley. Then place the pulley on the tensor.
- Start the engine and check the movement of the belt.

## 7.4.3 Belt route

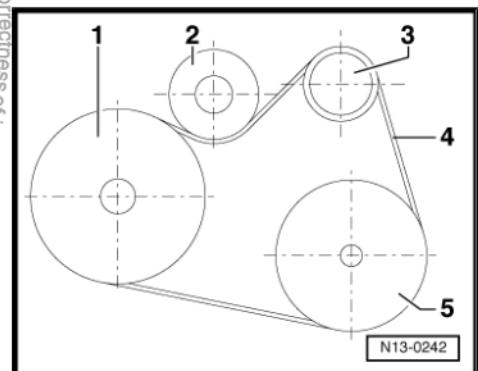
Gasoline-fueled vehicles equipped with air conditioning

- 1 - Power steering pump pulley
- 2 - Return pulley
- 3 - Alternator pulley
- 4 - Air conditioning compressor pulley
- 5 - Crankshaft pulley
- 6 - Tensioner pulley



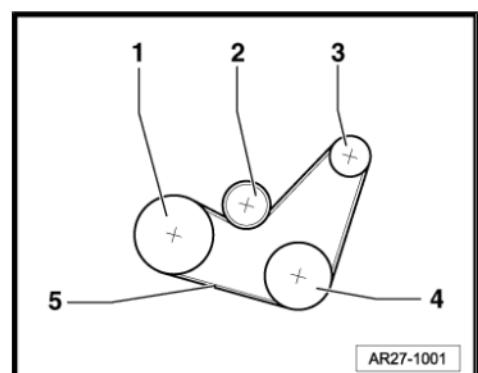
Gasoline-fueled vehicles equipped with air conditioning

- 1 - Crankshaft pulley
- 2 - Tensioner pulley
- 3 - Alternator pulley
- 4 - Poly-V belt
- 5 - Power steering pump pulley



Diesel vehicles with air conditioning

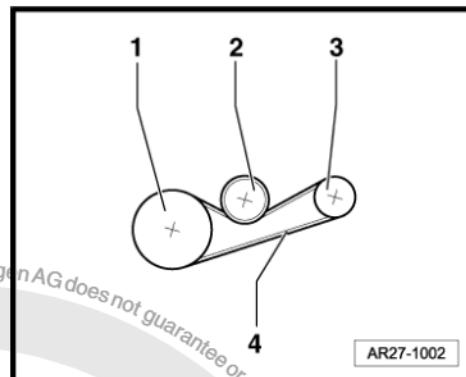
- 1 - Crankshaft pulley
- 2 - Tensioner pulley
- 3 - Alternator pulley
- 4 - Air conditioning compressor pulley
- 5 - Poly-V belt





Vehicles without air conditioning

- 1 - Crankshaft pulley
- 2 - Tensioner pulley
- 3 - Alternator pulley
- 4 - Poly-V belt



## 7.5 Generator (Alternator) -C- (valid for all motorizations CCRA, CFZA) - assembly overview

1 - Support

- For vehicles with air conditioning.

2 - Voltage regulator -C1-

- (Bosch) - disassemble and assemble  
[⇒ page 69](#).
- (Valeo) - disassemble and assemble  
[⇒ page 70](#).

3 - Protection cover

4 - Generator (Alternator) -C-

- Remove and install  
[⇒ page 67](#).
- Check the cable connection (B+)  
[⇒ page 61](#).
- Replace the Poly-V belt pulley [⇒ page 71](#).

5 - Poly-V belt (elastic)

- Remove and install ⇒ Engine; Rep. Gr. 13 ; Crankshaft, pistons .
- Check the Poly-V belt  
[⇒ page 61](#) .
- Poly-V belt run ⇒ Engine; Rep. Gr. 13 ; Crankshaft, pistons .

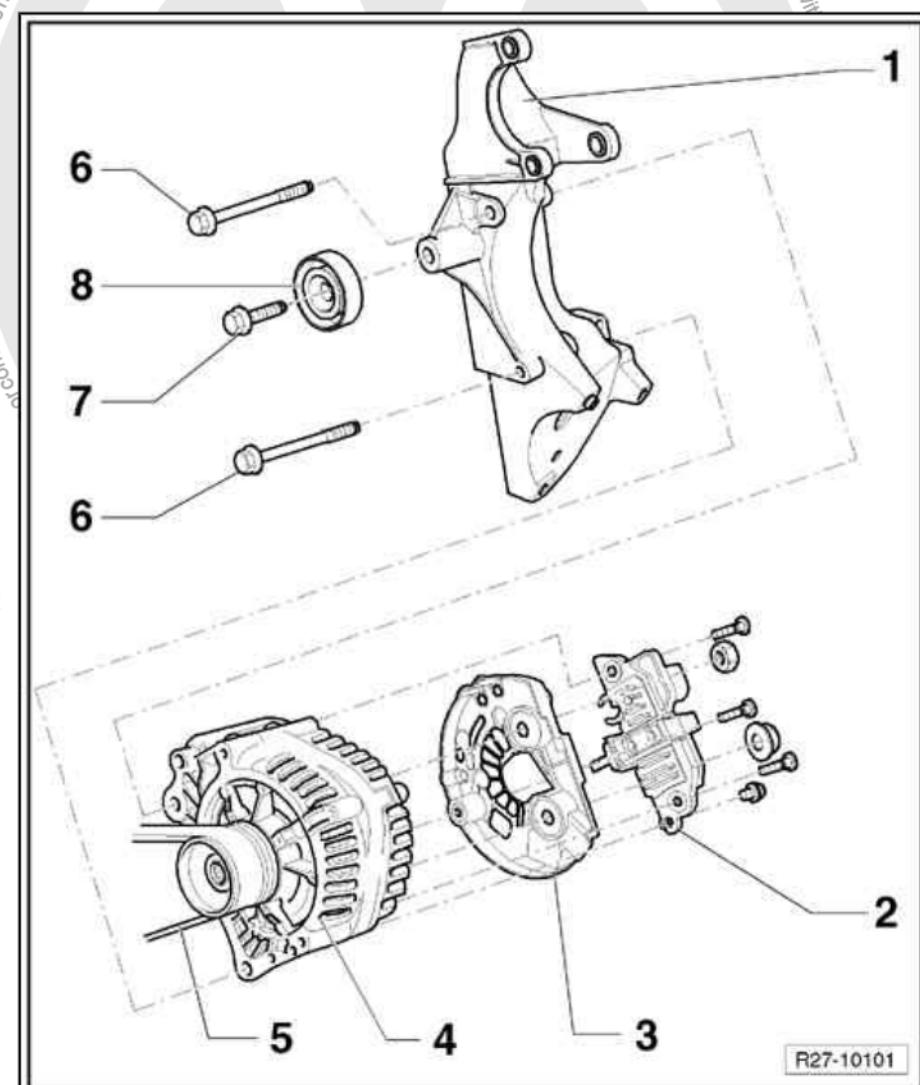
6 - Screw

- 23 Nm

7 - Screw

- 45 Nm

8 - Return pulley

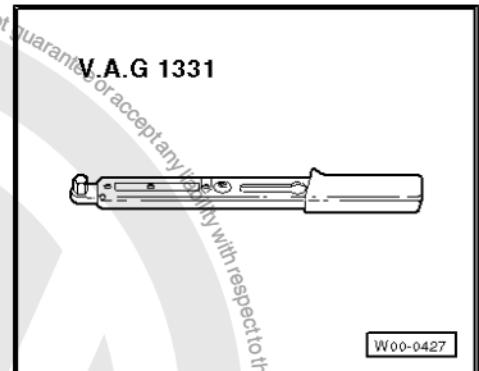




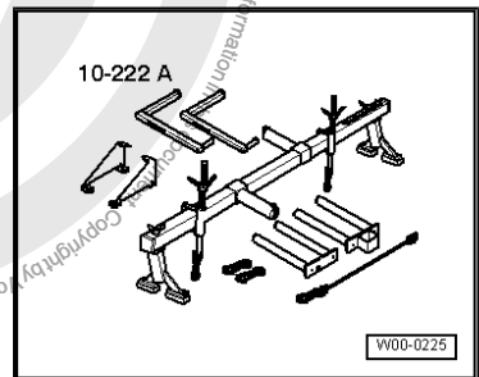
### 7.5.1 Generator (Alternator) -C- (valid for all motorizations CCRA, CFZA) - assembly overview

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-



- ◆ Support -10-222A-
- ◆ Installation device - 10-222 A/1-
- ◆ Adapter -T02007-
- ◆ Hoisting eyelets No. of the replacement part: Support -030 103 390 F- pulley side

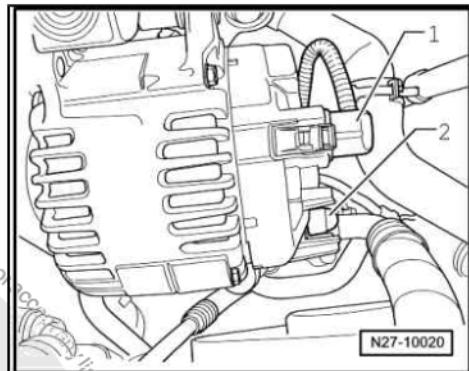


#### Removal:

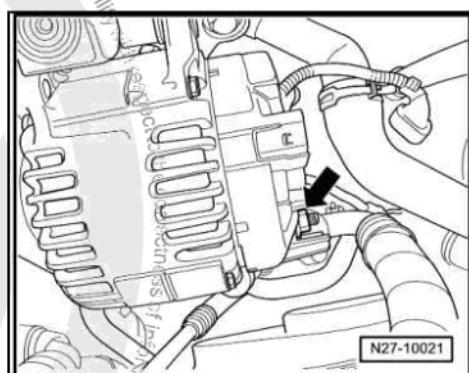
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [page 34](#) .
- Remove the lower engine noise insulation, if any ⇒ Body - external mountings; Rep. Gr. 50 ; Body - Front part .
- Remove wheel case cover (right side) ⇒ Body - external mountings; Rep. Gr. 66 ; External equipment .
- Mark the direction of movement of the Poly-V belt (elastic).
- Remove the Poly-V belt (elastic) ⇒ Engine; Rep. Gr. 13 ; Crankshaft, pistons .



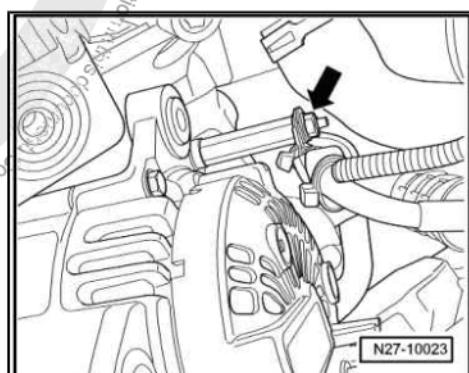
- Pull off connector -1- and remove protective cover -2-.



- Loosen the attaching nut -arrow- on cable (B+) and remove the cable.



- Loosen the attaching nut -arrow- from the cable support of Generator (Alternator) -C- .



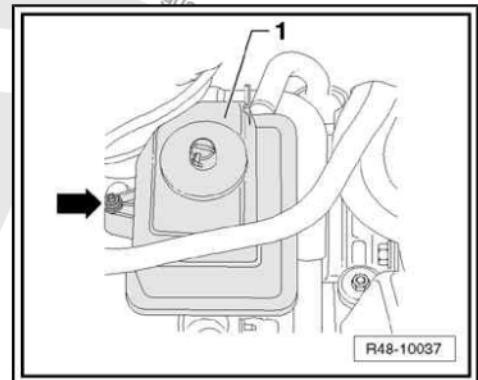


- Release the fastening screw -arrow- on the compensation reservoir.
- Remove the compensation reservoir from its support to facilitate access to the return pulley.



**WARNING**

*Please move the compensation reservoir carefully and support it with due care.*



- Remove the pulley from the power steering pump ⇒ Running gear, ??axles, ??steering; Rep. Gr. 48 ; Steering .
- Remove the Poly-V (elastic) belt from the air conditioning compressor ⇒ Engine; Rep. Gr. 13 ; Crankshaft, pistons .
- Remove the air conditioning compressor from its support ⇒ Heating, air conditioning; Rep. Gr. 87 ; Heating to clear space for passage by the Generator (Alternator) -C- .



**WARNING**

*The refrigerant gas circuit should not be opened.*

*Pay attention so that the flexible refrigerant hoses from the compressor are not pulled tight, mounting the compressor to the body with an adequate alternative mean, such as, for example, a wire.*

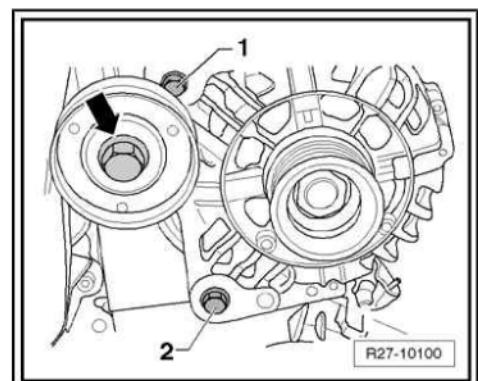


- Release the fastening screw -arrow- and remove return pulley.
- Loosen the fastening screws -1- and -2- of Generator (Alternator) -C- .
- Remove the Generator (Alternator) -C- .

**Installation:**

Install by inverting the removal sequence, paying attention to the following:

- First, place Poly-V belt on the crankshaft pulley, then on the tensioning pulley, as indicated on the belt run ⇒ Engine; Rep. Gr. 13 ; Crankshaft, pistons .
- Tighten the fastening nuts and screws to the tightening torque specified ⇒ [page 73](#) .



*After installation, start the engine and check the belt motion.*

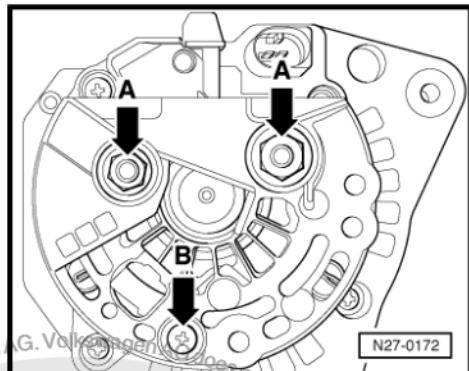
## 7.6 Voltage regulator (Bosch) - remove and install

### 7.6.1 Removal

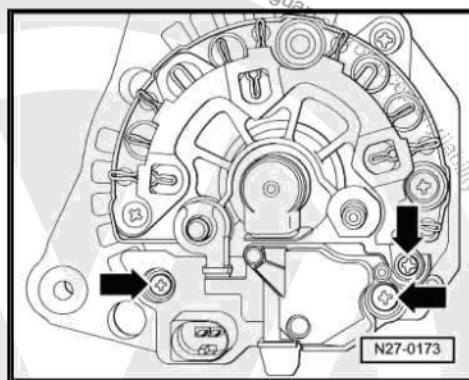
- Removing alternator ⇒ [page 60](#) .



- Loosen the fastening nuts -A- and the fastening screw -B- from the protection cover and remove it.



- Loosen the fastening screws -arrows- from the voltage regulator.
- Remove the voltage regulator.



## 7.6.2 Installation

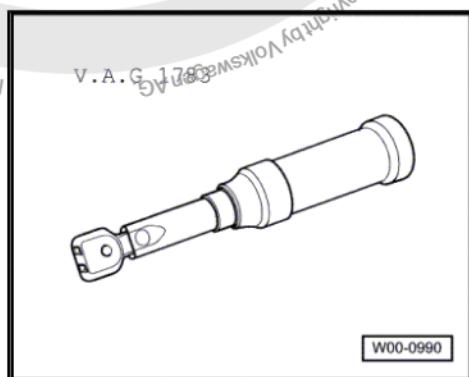
Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing nuts and screws with the indicated tightening torque [⇒ page 73](#).

## 7.7 Voltage regulator (Valeo) - remove and install

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-

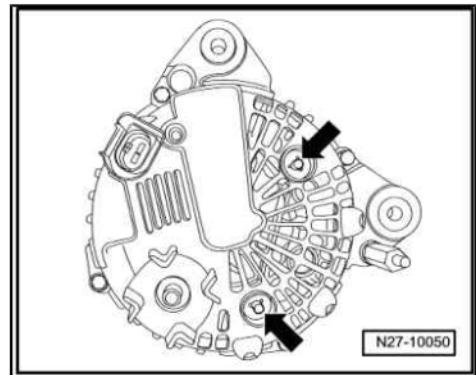


## 7.7.1 Removal

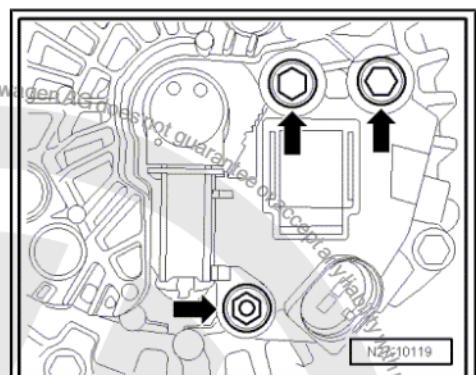
- Removing alternator [⇒ page 60](#).



- Loosen the fastening nuts -arrows- and remove the protection cover.



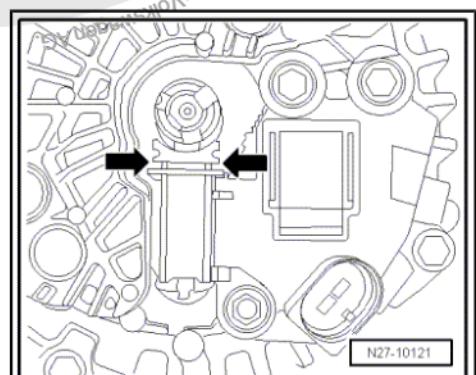
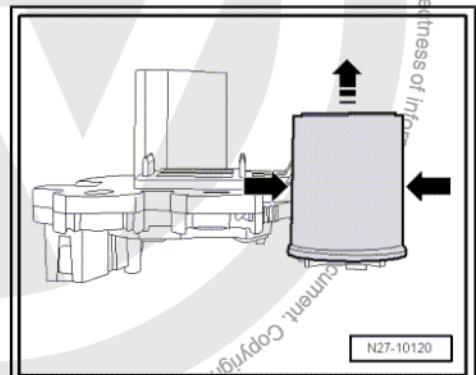
- Loosen the fastening screws -arrows- from the voltage regulator.
- Remove the alternator voltage regulator.



### 7.7.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Release the locks -arrows- and remove the voltage regulator protection cover.
- Insert carbon brushes into the voltage regulator box and assemble the voltage regulator on the alternator.
- Tighten the fixing nuts and screws with the indicated tightening torque [⇒ page 73](#).
- Push the protection cover in the guide rails -arrows- until you hear it click.

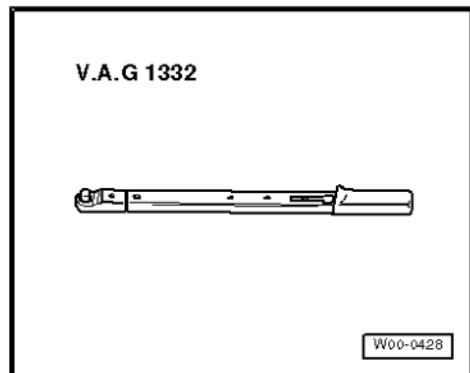


### 7.8 Poly-V belt alternator pulley - replace

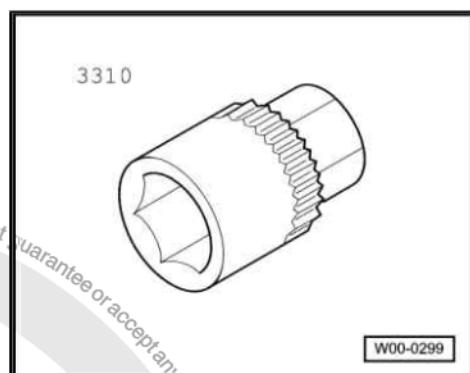
Special tools and workshop equipment required



- ◆ Torquemeter - 40 to 200 Nm (socket 1/2") -VAG 1332-

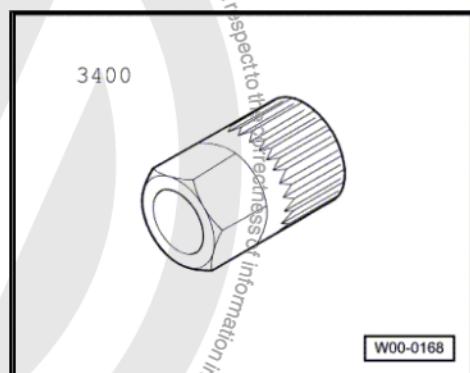


- ◆ Adapter socket -3310-



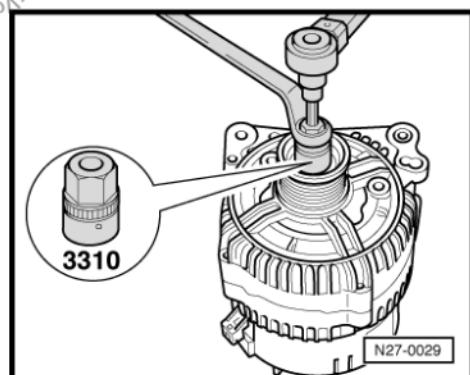
or

- ◆ Multi-teeth adapter -3400-



### 7.8.1 Removal

- Removing alternator [page 60](#).
- Install the alternator by its fixing points on a bench vice.
- Release the securing nut for the Poly-V belt pulley without freewheel with Adapter socket -3310- , or with Multi-teeth adapter -3400- for the Poly-V belt pulley with freewheel.





## 7.8.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing nut with the indicated tightening torque  
⇒ page 73 .

## 7.9 Tightening torques - Alternator

Location	Tightening torque	
Cable (B+) to the alternator	M8	15 Nm
Cable support to alternator	M5	4.5 Nm
Alternator's voltage regulator (Bosch, Valeo)	M4	2 Nm
Protection cover to alternator (Bosch)	M5	4.5 Nm
Poly-V belt pulley with freewheel unit to alternator	M10	80 Nm
Return pulley	M10	45 Nm
Poly-V belt pulley without freewheel unit to alternator	M10	65 Nm
Compensation reservoir	M6	10 Nm
Alternator to compact support	M8	23 Nm





## 90 – Instrument case, indicators

### 1 Combined instrument (up to the model 2010)

#### General description

The combined instrument has the following components:

- ◆ Control unit with indicator in the combined instrument -J285-
- ◆ Immobilizer control unit -J362-
- ◆ Speedometer
- ◆ Tachometer (rotation counter)
- ◆ Fuel level indicator
- ◆ Multi-function Indicator
- ◆ Control lamps [⇒ page 77](#)



#### Note

*The immobilizer is inserted in the combined instrument for European market vehicles.*

All control lamps are constituted by lighting diodes (LED's). No repair work on the combined instrument is foreseen. If necessary, replace the entire combined instrument [⇒ page 75](#).

#### Fault identification and location

The combined instrument is equipped with self-diagnosis which makes fault finding easier.

For troubleshooting, use the Diagnosis, Measurement and Information System -VAS 5051A/52- .

- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#) .
- Select, on Diagnosis, Measurement and Information System -VAS 5051A/52- function **Assisted Fault Pinpointing**.
- Select the corresponding version, vehicle, model, year and engine and press **Advance**.

### 1.1 Combined instrument - replace

Job sequence "Combined instrument - replace" includes the following works:

- ◆ When installing a new combined instrument, it is necessary to adjust the combined instrument control unit to the different equipment characteristics and corresponding variants related to each country.
- ◆ In order to adjust the built-in immobilizer to the engine control unit, the engine control unit data shall be memorized in the combined instrument of replacement.
- ◆ After installation of a new combined instrument, all vehicle keys shall be adapted.
- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#) .



- Selection Diagnosis, Measurement and Information System -VAS 5051A/52- function **Assisted Fault Pinpointing**.
- Select the corresponding version, vehicle, model, year and engine and press **Advance**.

After consulting all command units, select the following functions:

- ◆ **Advance**
- ◆ **Go to**
- ◆ **Selection of Functions/Components**
- ◆ **Body**
- ◆ **Electrical System**
- ◆ **01-Systems capable for Self-diagnosis**
- ◆ **Combined instrument**
- Continue selecting the functions you want in Diagnosis, Measurement and Information System -VAS 5051A/52- ⇒ Vehicle diagnosis, testing and information system VAS 5051.

## 1.2 Combined instrument - Remove and install



### WARNING

*Before working on the electrical system, it is necessary to disconnect the battery earth strap of [page 34](#).*



### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap.*
- ◆ *When the battery is reconnected, check the operation of the vehicle electrical system (radio, clock and electric door and window locks, etc.) according to the Workshop Manual and/or instructions for use.*
- ◆ *Before removing the combined instrument, observe the fault identification and pinpointing notes and job instructions.*

### 1.2.1 Removal



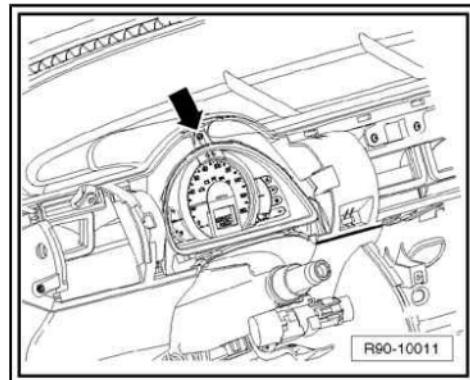
### Note

*It is not necessary to remove the steering wheel. For better viewing the illustrations, the steering wheel is not represented.*

- Position the steering wheel with the adjustment device fully outwards and lock it at the lowest position.
- Remove the left air vent ⇒ Body - internal mountings; Rep. Gr. 70 ; Instrument panel - remove and install .
- Remove dashboard lower central frame ⇒ Body - internal mountings; Rep. Gr. 70 ; Instrument panel - remove and install .



- Remove the dashboard's central air vent and frame set ⇒ Body - internal mountings; Rep. Gr. 70 ; Instrument panel - remove and install .
- Remove the screw -arrow-.
- Carefully disengage the combined instrument and disconnect its connector.
- Remove the combined instrument.



## 1.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
⇒ [page 78](#) .
- After installation check the functions of the combined instrument.

## 1.3 Combined instrument connector occupation

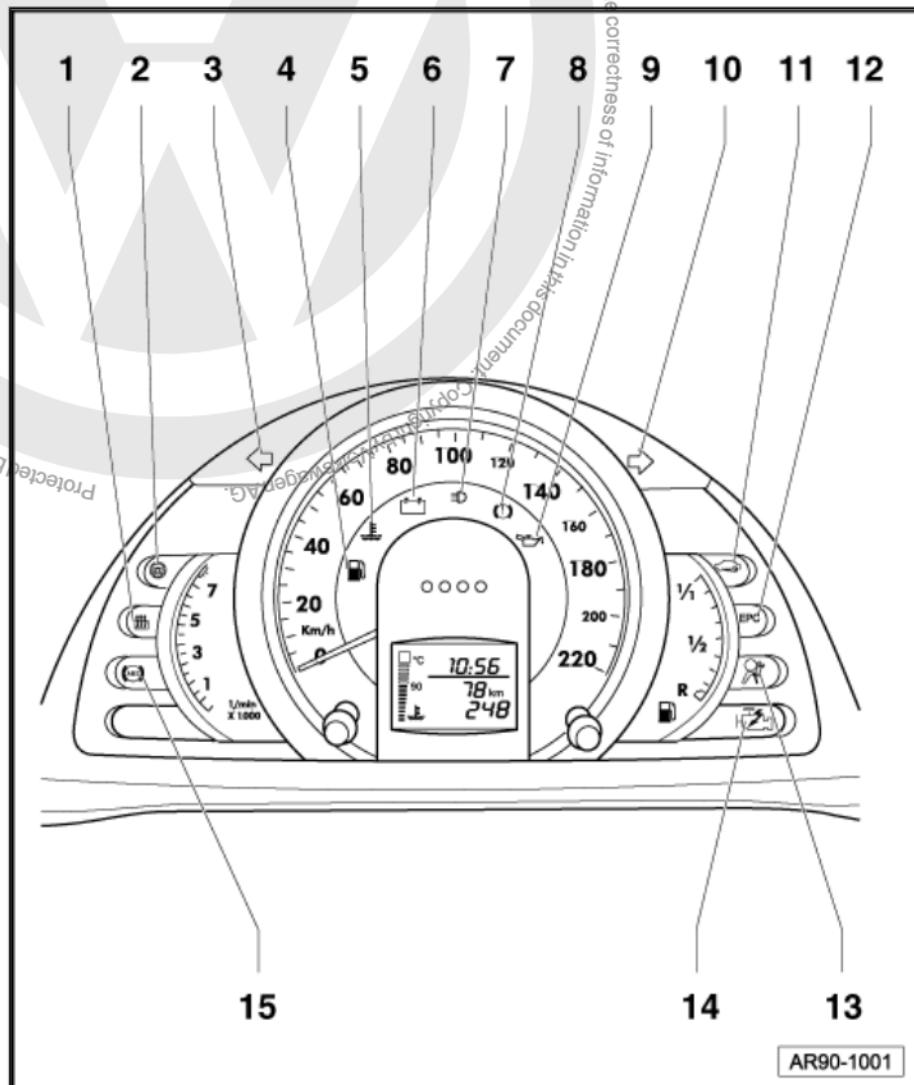
The pin occupation of the 32 poles connector (blue) of combined instrument is described in the electrical diagrams ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



## 1.4 Control lamp symbology on the combined instrument

### 1.4.1 Gasoline/totalflex vehicles

- 1 - Rear window heating
- 2 - Power steering
- 3 - Left turn signal
- 4 - Fuel reserve
- 5 - Coolant
- 6 - Load control - generator
- 7 - Main beam
- 8 - Brake system control
- 9 - Oil pressure
- 10 - Right turn signal
- 11 - Immobilizer
- 12 - EPC
- 13 - Airbag
- 14 - OBD
- 15 - ABS

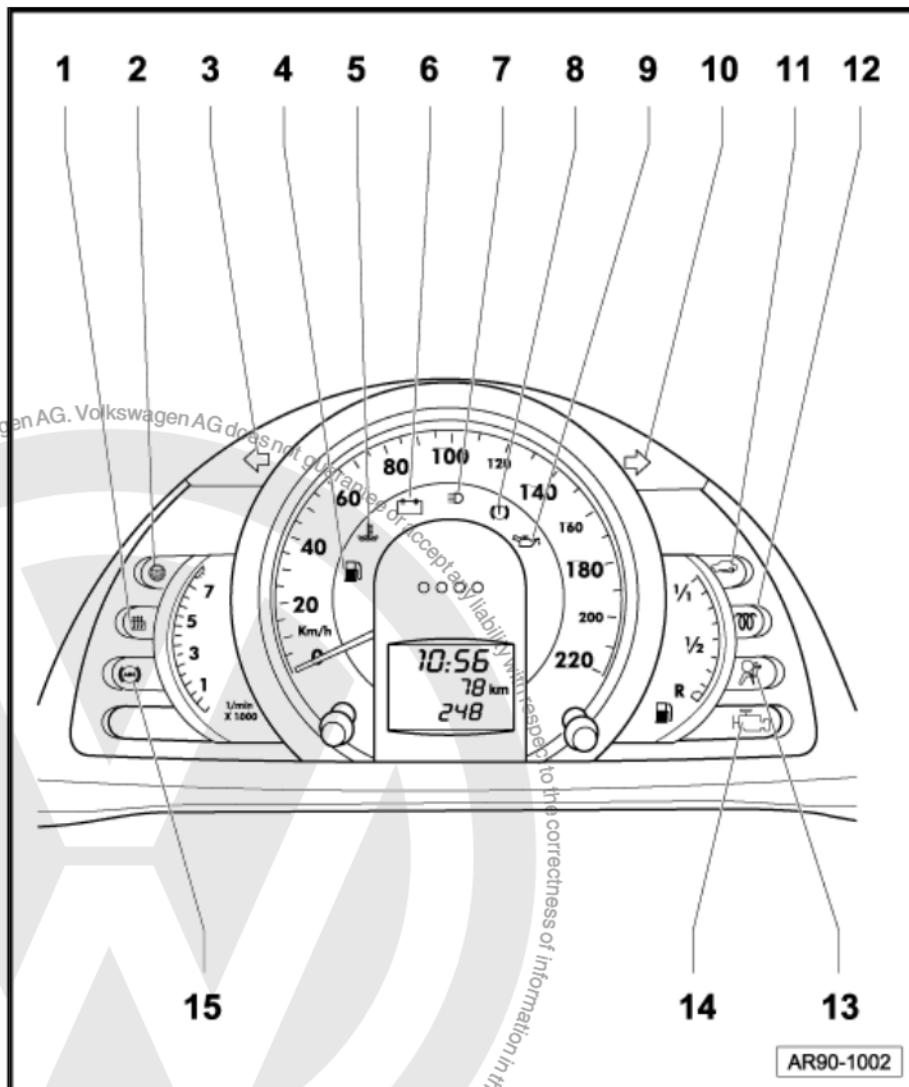


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## 1.4.2 Diesel-fueled vehicles

- 1 - Rear window heating
- 2 - Electric power steering (EHPS)
- 3 - Left turn signal
- 4 - Fuel reserve
- 5 - Coolant
- 6 - Load control - generator
- 7 - Main beam
- 8 - Brake system control
- 9 - Oil pressure
- 10 - Turn signal - right
- 11 - Immobilizer
- 12 - Pre-heating - diesel
- 13 - Airbag
- 14 - OBD
- 15 - ABS



## 1.5 Tightening torque

Location	Tightening torque
Combined instrument	1.5 Nm



## 2 Combined instrument (up from model-year 2011)

General description:

The Combined instrument -K- has the following components:

- ◆ Control unit with indicator in the combined instrument -J285- .
- ◆ Immobilizer control unit -J362- .
- ◆ Speedometer -G21- .
- ◆ Tachometer -G5- .
- ◆ Fuel level indicator -G1- .
- ◆ Coolant temperature indicator -G3- .
- ◆ Multi-function indicator.
- ◆ Control light symbols [⇒ page 84](#) .

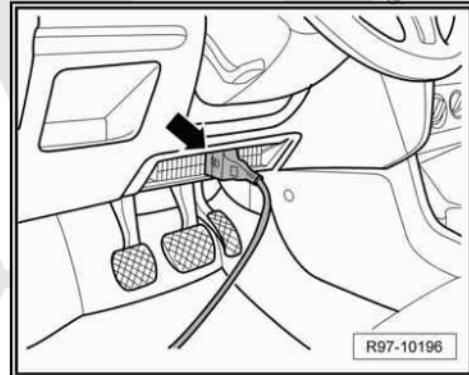
All the light displays are equipped with light emitting diodes (LEDs). No repair work is expected for the Combined instrument -K- . If necessary, replace the entire Combined instrument -K- Chapter [⇒ page 74](#) .

### 2.1 Location and Indication of defects

The Combined instrument -K- is equipped with self-diagnosis function.

To locate defects, the Diagnosis, Measurement and Information System -VAS 5052- .

- Connect the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97 ; Cables and wiring harnesses on the 16-pin diagnostic connector -T16- -arrow-.
- Turn the ignition on.
- Turn off all electrical components.
- Proceed by selecting the desired functions ⇒ Vehicle diagnosis, testing and information system VAS 5051.



### 2.2 Combined instrument -K- - replace



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#) .*



 Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Before removing the Combined instrument -K- , follow the notes and work instructions for troubleshooting.
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Diagnosis, Measurement and Information System - VAS 5051-
- ◆ Diagnosis, Measurement and Information System - VAS 5052-
- ◆ Diagnostic cable -VAS 5051/6B-
- ◆ Diagnostic cable -VAS 5052/3A-
- ◆ Wireless diagnostic connector -VAS 5054A-



Job sequence "Combined instrument - replace" includes the following works:

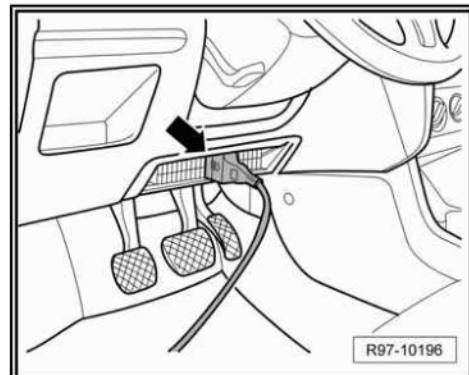
- ◆ When installing a new Combined instrument -K- it is necessary to adjust the Control unit w/ indicator on the combined instrument -J285- to the different equipment features and corresponding country-related variations.
- ◆ To adapt the Immobilizer control unit -J362- to Engine control unit -J623- save the Engine control unit -J623- on the Combined instrument -K- for service.



- ◆ After installing a new Combined instrument -K- , it is necessary to adapt all vehicle keys.

To adapt, use the Diagnosis, Measurement and Information System -VAS 5052- .

- Connect the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97 ; Cables and wiring harnesses on the 16-pin diagnostic connector - T16- .
- Turn the ignition on.
- Turn off all electrical components.
- Proceed by selecting the desired functions ⇒ Vehicle diagnosis, testing and information system VAS 5051.



## 2.3 Combined instrument -K- - remove and install



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- ⇒ [page 34](#) .*

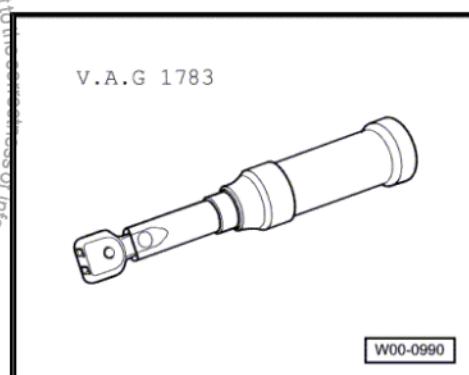


### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Before removing the Combined instrument -K- , follow the notes and work instructions for troubleshooting ⇒ [page 79](#)
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



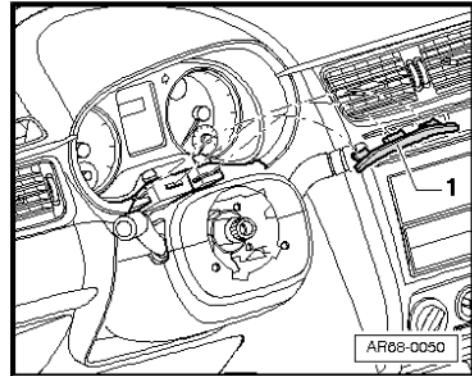


### 2.3.1 Removal

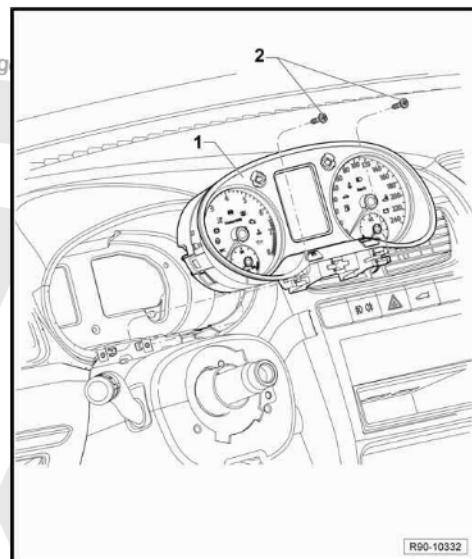


*It is not necessary to remove the steering wheel. For improved visualization, the steering wheel is not shown.*

- Position the steering wheel with adjustment device totally outwards and lock in the lowest position (vehicle with steering position adjustment).
- Carefully remove the border -1- from the instrument panel ⇒ Body - internal mountings; Rep. Gr. 68 ; Internal equipment .



- Release the fastening screw -2- of Combined instrument -K- -1-.
- Carefully disengage the Combined instrument -K- and release its connector.
- Remove the Combined instrument -K- .



### 2.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten fastening screw on the Combined instrument -K- with a torque of 1.5 Nm.
- After installation, check the functions and adapt in case of replacement of Combined instrument -K- [⇒ page 79](#) .

## 2.4 Combined instrument -K- description of rear part



*No repair work is expected for the Combined instrument -K- .*



1 - Combined instrument -K-

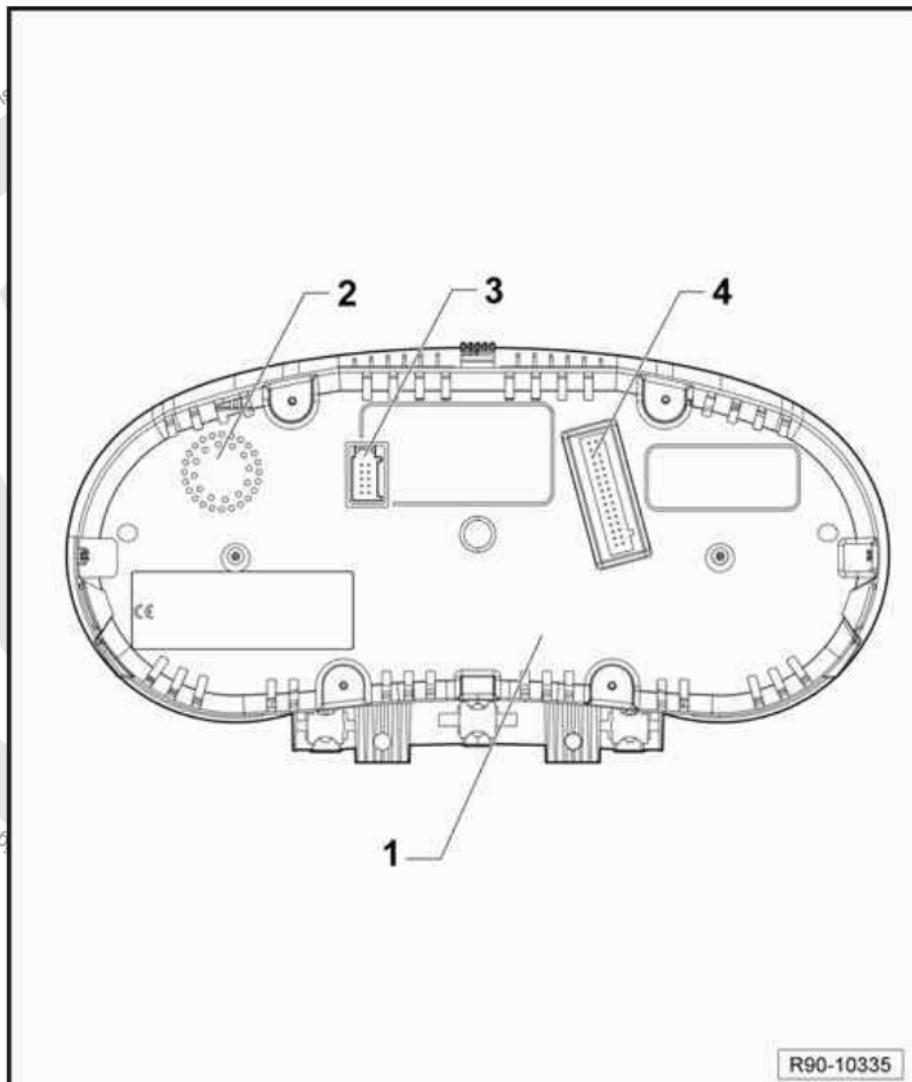
2 - Alarm (acoustic warning)

3 - 10-pin connector

- connector occupation  
⇒ [page 83](#)

4 - 32-pin connector

- connector occupation  
⇒ [page 83](#)



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## 2.5 Combined instrument -K- - connector pinout

The arrangement of the 32-pole and 10 pole-connector pins of Combined instrument -K- is described in the electrical diagrams  
⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



## 2.6 Combined instrument -K- - control light symbols

### 2.6.1 MID Version

1 - Coolant temperature control light -K43-

2 - Oil pressure control light -K3-

3 - "E-gas" system failure indicator light -K132-

4 - Not used

5 - Brake system control light -K118-

6 - Airbag warning light -K75-

7 - ABS control light -K47-

8 - Warning light - exhaust gas -K83-

On-Board Diagnosis (OBD).

9 - Left turn signal control light -K65-

10 - Odometer -Y4-

11 - Right turn signal control light -K94-

12 - Immobilizer control light -K117-

13 - Not used

14 - High beam control light -K1-

15 - Rear window heating control light -K10-

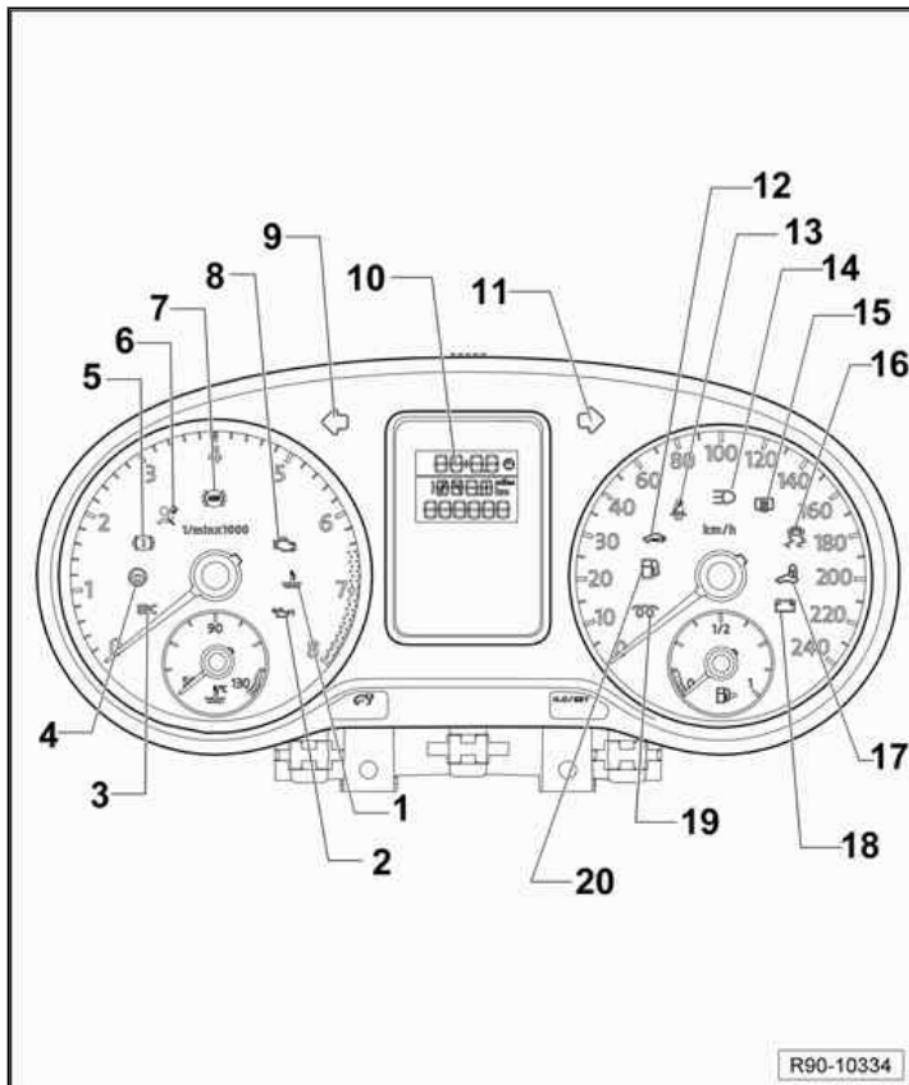
16 - Not used

17 - Control lamp for the "SAFE" system in the central locking -K133-

18 - Alternator control light -K2-

19 - Not used

20 - Fuel reserve control light -K16-





## 2.6.2 Version HIGH

1 - "E-gas" system failure indicator light -K132-

Petrol engine vehicles only.

2 - Not used

3 - Brake system control light -K118-

4 - Airbag warning light -K75-

5 - ABS control light -K47-

6 - Warning light - exhaust gas -K83-

On-Board Diagnosis (OBD).

7 - Left turn signal control light -K65-

8 - Display

9 - Right turn signal control light -K94-

10 - Immobilizer control light -K117-

11 - Not used

12 - High beam control light -K1-

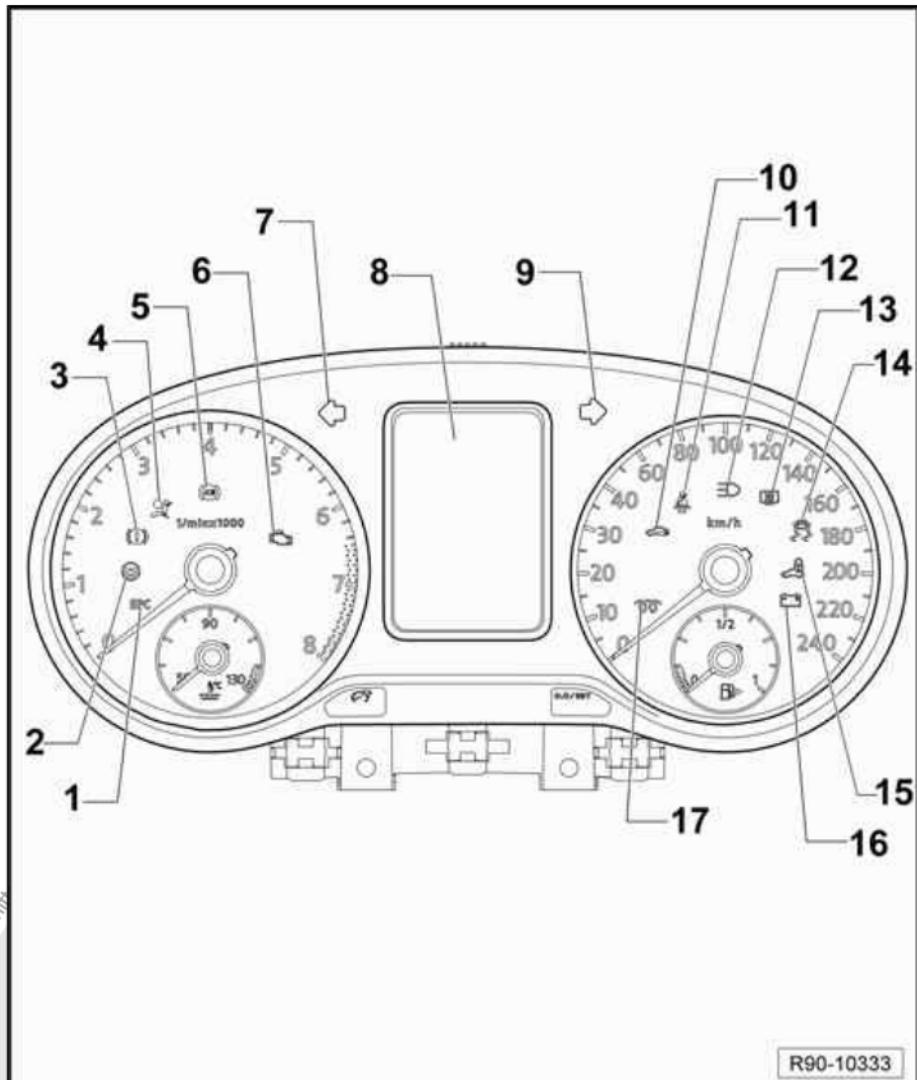
13 - Rear window heating control light -K10-

14 - Not used

15 - Control lamp for the "SAFE" system in the central locking -K133-

16 - Alternator control light -K2-

17 - Not used



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## 92 – Windshield wiper and washer, rear window and headlights

### 1 Windshield wiper system



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the battery earth strap of [page 34](#).*

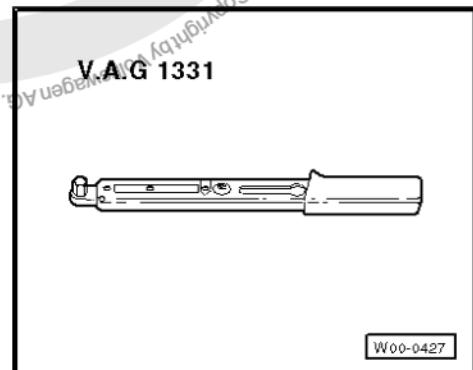


#### Note

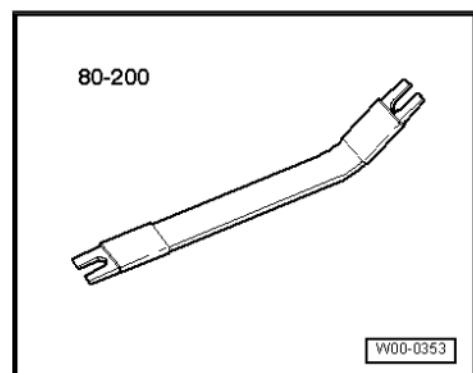
- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap.
- ◆ When the battery is reconnected, check the operation of the vehicle electrical system (radio, clock and electric door and window locks, etc.) according to the Workshop Manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-



- ◆ Ejector lever -80-200-





## 1.1 Windshield wiper system - Assembly overview

### 1 - Windshield wiper blade

- Remove and install  
[⇒ page 89](#).
- Adjust the application angle  
[⇒ page 90](#).

### 2 - Windshield wiper arm

- Remove and install  
[⇒ page 87](#).
- Adjust the resting position  
[⇒ page 90](#).

### 3 - Protection covers

### 4 - Hexagon nut M8

- 17 Nm

### 5 - Screw M6

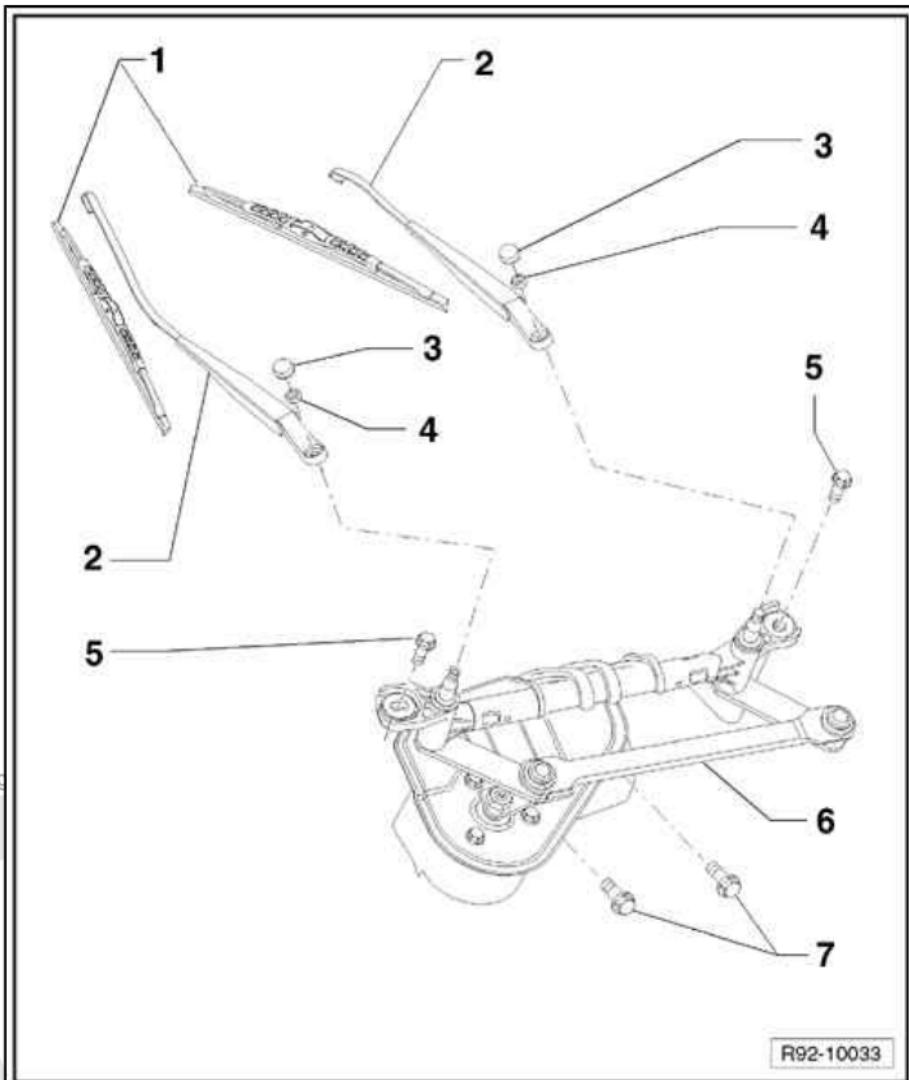
- 5 Nm

### 6 - Windshield wiper mechanism

- Remove and install  
[⇒ page 88](#).

### 7 - Screw M6

- 5 Nm



## 1.2 Windshield wiper blade and arm set - remove and install

### 1.2.1 Removal



#### Note

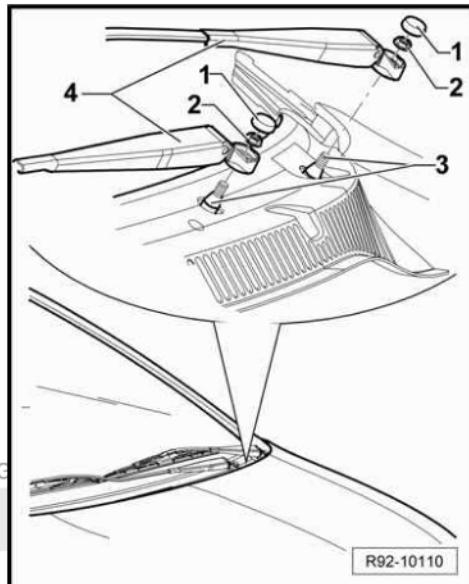
Before removing the windshield wiper arms, check if the Windshield wiper motor -V- is in the resting position. This is the only way the correct arm resting position can be adjusted during the installation.

- Remove the protection covers carefully -1- with a screwdriver.

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- Loosen hexagonal nuts -2- but do not remove it completely.
- Move carefully the windshield wiper arms -4- until releasing them from the windshield wiper mechanism -3-.
- Remove the hexagon nuts -2- and remove the windshield wiper arms -4-.



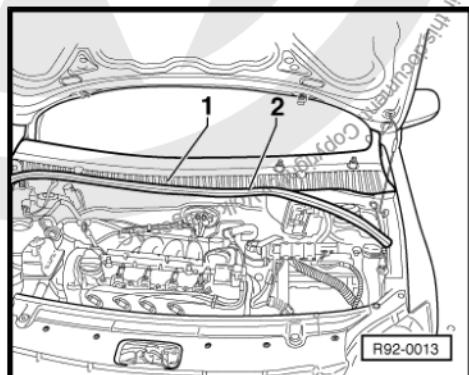
### 1.2.2 Installation

- Fit the windshield wiper arms near its resting positions and tighten slightly the fastening nuts.
- Adjust the blade resting position [⇒ page 90](#).
- Tighten the fastening nuts to (18-Nm) torque.
- Install the protection covers.

## 1.3 Windshield wiper mechanism - remove and install

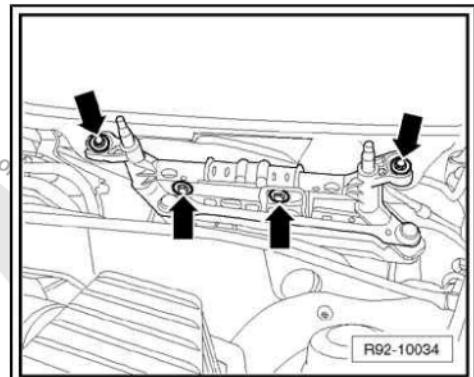
### 1.3.1 Removal

- Remove the windshield wiper assembly [⇒ page 87](#).
- Remove sealing -2- and water deflector -1-.⇒ Rep. Gr. 66 .





- Remove screws -arrows-.
- Disconnect the connector at the windshield wiper engine.
- Remove the windshield wiper mechanism.



### 1.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixation screws with the indicated torque  
[⇒ page 104](#) .

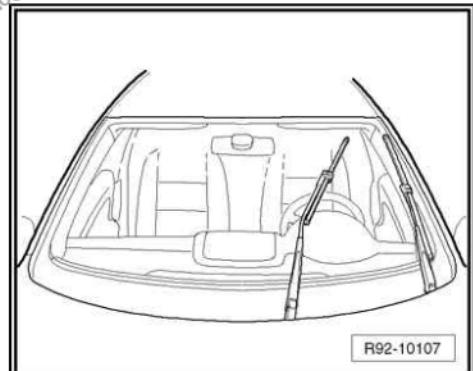
## 1.4 Windshield wiper blade - remove and install

### 1.4.1 Removal

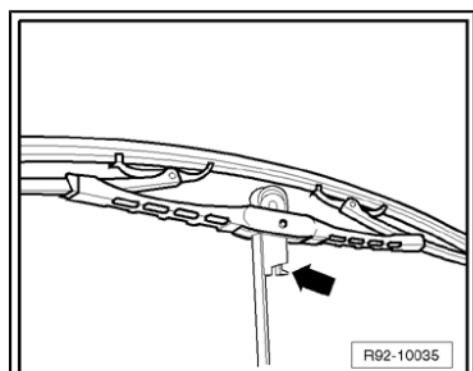
- Place arms in "service/winter position".

A "service/winter position" is activated when the windshield wiper lever is activated in the "timer operation" position within 10 seconds after turning the ignition off. [Vehicle's instruction manual](#) .

- Raise the windshield wiper arm.



- Press the blade lock -arrow- and pull down in direction of the windshield wiper rod.
- Release the blade from the windshield wiper arm and remove it.



### 1.4.2 Installation

Installation is carried out in the reverse order of removal.



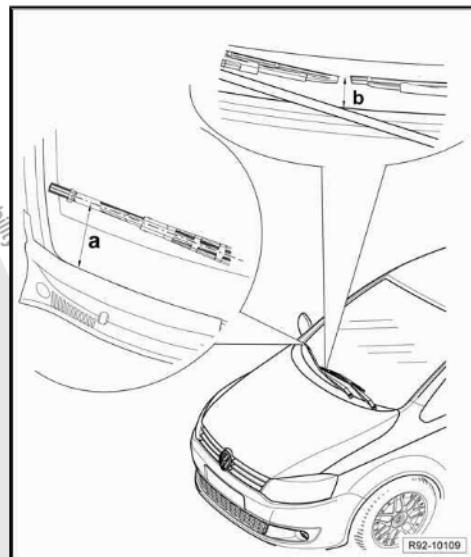
## 1.5 Windshield wiper blade resting position - adjust

### 1.5.1 Driver's and passenger's side

Measurement -nd- between the edge of the right windshield wiper blade and the water reflector should be  $38 \pm 5$  mm.

Measurement -b- between the aligned edges of the windshield wiper blades and the water reflector should be 25 mm.

- If necessary, adjust the windshield wiper blade resting position by releasing and moving the wiper arm/blade assembly.
- Remove the windshield wiper arm/blade assembly  
⇒ [page 87](#).



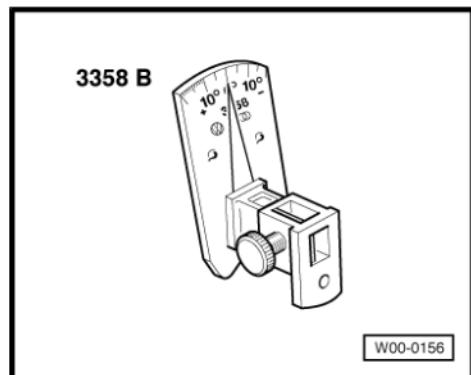
## 1.6 Blade application angle on the windshield - adjust



*Only check the blade application angle when the wipers vibrate or make noises.*

Special tools and workshop equipment required

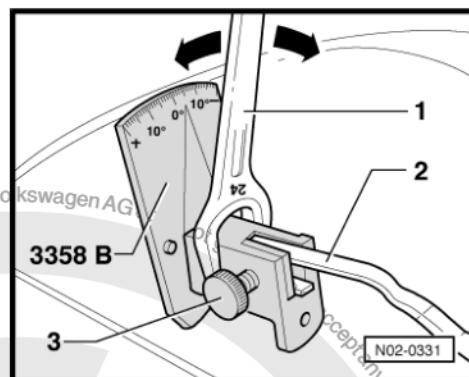
- ◆ Adjusting device -3358B-



- Adjust the resting position of the windshield wiper arms  
⇒ [page 90](#).



- Remove the blades from the windshield wiper arms [⇒ page 89](#).
- Place the windshield wiper arm -2- on the Adjusting device -3358B- and fasten it with the screw -3-.
- Check the application angle according to the following table:



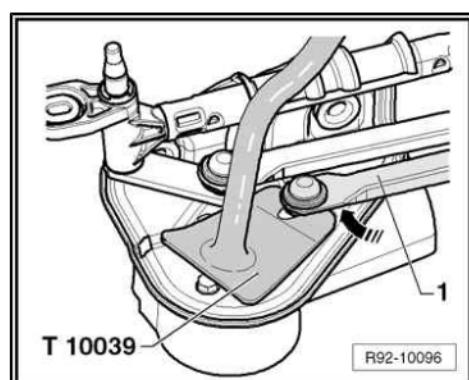
Application angle (nominal values) for	
Driver side	-5.0°
Passenger side	-5.0°
Tolerance	±2°

- If necessary, adjust the application angle to the nominal value as explained below:
- Using a SW24 spanner -1-, tilt the windshield wiper arms -2- according to the nominal value-arrows-.
- Release the windshield wiper arm -2- of Adjusting device -3358B- and fasten it again with the screw -3-.
- Compare the adjusted value with that given in the table. If necessary, repeat the operation until obtaining the nominal value.
- Remove the Adjusting device -3358B- and install the windshield wiper blade [⇒ page 89](#).
- Check whether the windshield wiper vibrates.

## 1.7 Windshield wiper motor -V- - disassem- ble and assemble

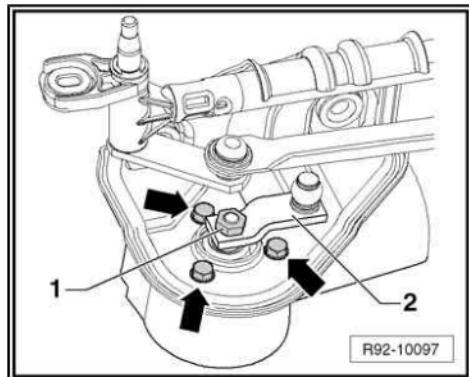
### 1.7.1 Disassembly

- Turn the ignition and all electric components off and remove the key from the ignition.
- Remove the windshield wiper assembly [⇒ page 87](#).
- Remove the windshield wiper mechanism [⇒ page 88](#).
- Disengage the operation rod -1- in the direction of the -arrow- from shaft, by using the Lever -T 10039- .





- Loosen the attaching nut -1- and remove the support -2- from the shaft Windshield wiper motor -V- .
- Loosen the fastening screws -arrows- from the windshield wiper mechanism assembly.
- Remove the Windshield wiper motor -V- out of its housing.



### 1.7.2 Assembly

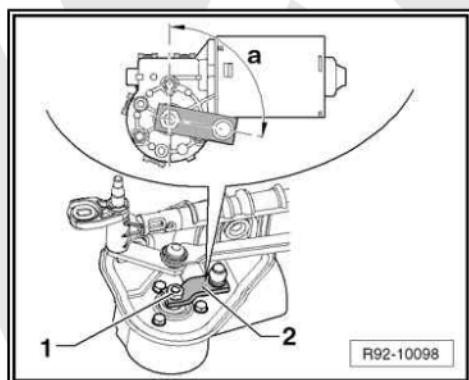
Assembly is performed in the reverse order to dismantling, observing the following:



Note

Place the Windshield wiper motor -V- in its rest position.

- Position the Windshield wiper motor -V- on the windshield wiper mechanism assembly and tighten the attaching bolts to the torque of 9 Nm.
- Install the shaft support -2- must be placed to ensure dimension -nd- is  $100^{\circ}44' \pm 5'$  and tighten the fastening nut -1- with a torque of 18 Nm.





## 2 Windshield washer system



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

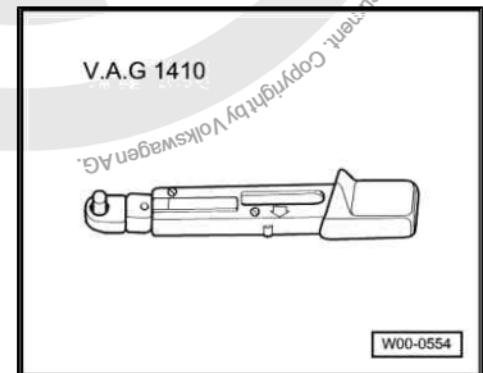


### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

- ◆ Torque wrench - 4 to 20 Nm (socket 3/8") -VAG 1410-





## 2.1 Windshield washer system - assembly overview

### 1 - Spray nozzles

- Replace [⇒ page 95](#).
- Adjust [⇒ page 96](#).

### 2 - Connector of Windshield washer pump -V5- and/or Rear window washer pump -V13-

### 3 - Windshield washer pump -V5- and/or Rear window washer pump -V13-

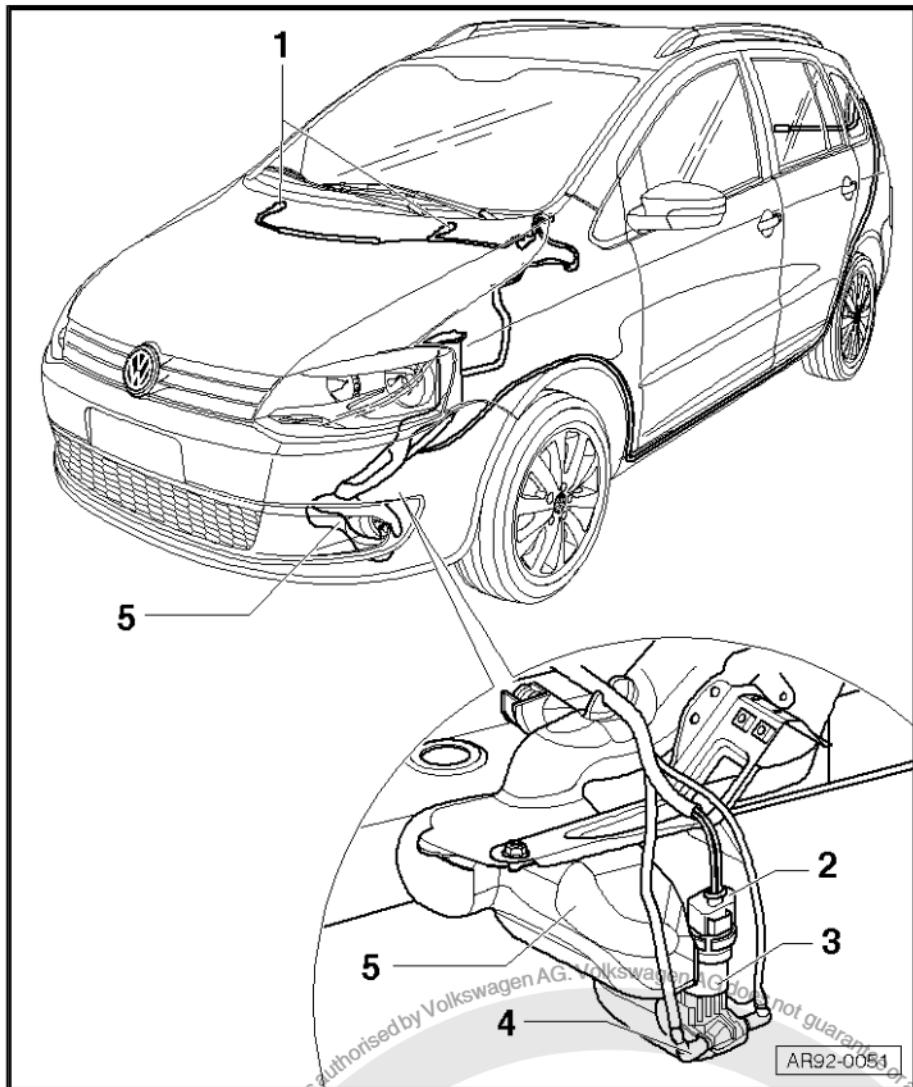
- Remove and install [⇒ page 95](#).

### 4 - Front washer hose

- Connections ⇒ General information; Rep. Gr. 92 ; Windshield wiper and washer, rear window and headlights .
- Repair ⇒ General information; Rep. Gr. 92 ; Windshield wiper and washer, rear window and headlights .

### 5 - Reservoir for the windshield washer system

- Remove and install [⇒ page 94](#).



## 2.2 Reservoir for the windshield washer system - remove and install

### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Put vehicle in a lift in order to make the operation easier.
- Remove the left and right front wheel housing protector ⇒ Body; Rep. Gr. 66 ; Front wheel housing protector - remove and install .
- Remove front bumper ⇒ Body - external mountings; Rep. Gr. 63 ; bumpers .
- Disconnect the connector from the Windshield washer pump -V5- and/or Rear window washer pump -V13- [⇒ page 95](#).
- Drain the reservoir liquid.



- Remove the fastening nuts -arrows- from reservoir.
- Remove reservoir from the bottom of vehicle.

**Installation:**

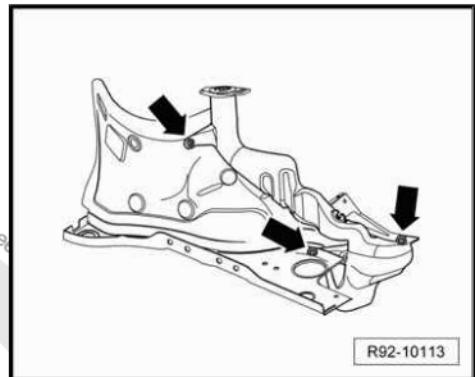
Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening nuts to a 5-Nm torque.



**Note**

*When replenishing the reservoir. If fluid is used, refer to the mixture ratio in ➤ Maintenance ; Booklet 22.1 .*



R92-10113

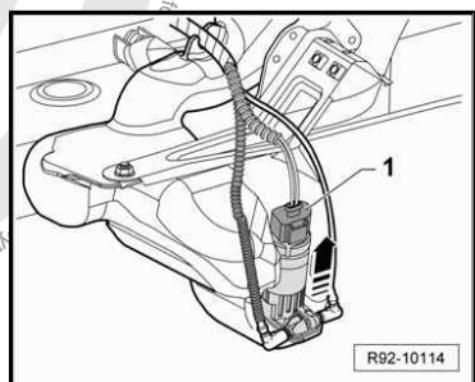
## 2.3 Windshield washer pump -V5- and/or Rear window washer pump -V13- - remove and install

**Removal:**

- Remove the left front wheel case cover ➤ Body - external mountings; Rep. Gr. 66 ; External equipment .
- Pull off connector -1- and the hose connections in the pump.
- Remove the pump from the reservoir, moving it towards -arrow-.

**Installation:**

Installation is carried out in the reverse order of removal.

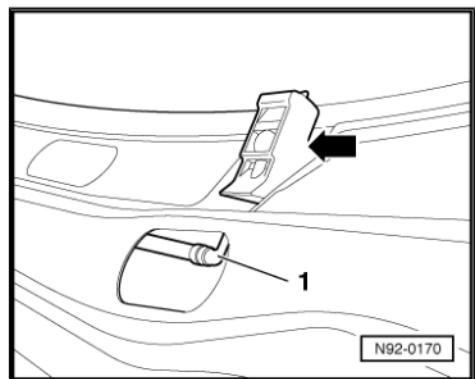


R92-10114

## 2.4 Windshield washer system spray nozzles - replace

**Removal:**

- Remove the hose from the spray nozzle -1-.



N92-0170



- Press the spray nozzle towards -arrow- and remove it downwards.

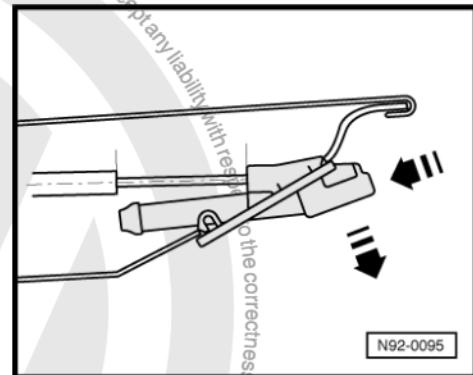
Installation:

Installation is carried out in the reverse order of removal.



Note

After installing, use the adjustment procedures for the spray nozzles [⇒ page 96](#).



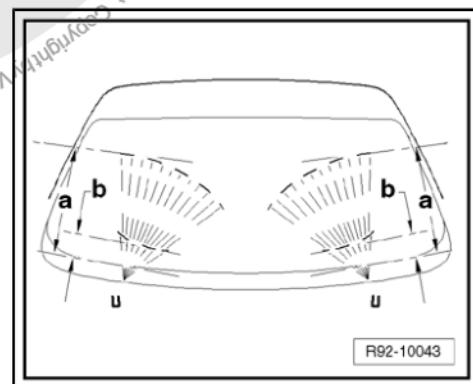
## 2.5 Windshield washer system spray nozzles - adjust

### 2.5.1 Pre-adjusted spray nozzles (fan-type nozzles)



Note

- ◆ The spray nozzles are pre-adjusted, but small differences in height can be adjusted.
- ◆ If the spray jet is irregular or cannot be adjusted to the center of the washer area, the nozzle must be replaced (repair measure) [⇒ page 95](#).
- ◆ Under no circumstances should needles or similar objects be used, since this might damage the nozzle's water passage.
- ◆ Nozzles should not be cleaned in the opposite direction of spray jet (for example: blowing forward).



Nozzle jet position:

nd - 480 mm

b - 165 mm

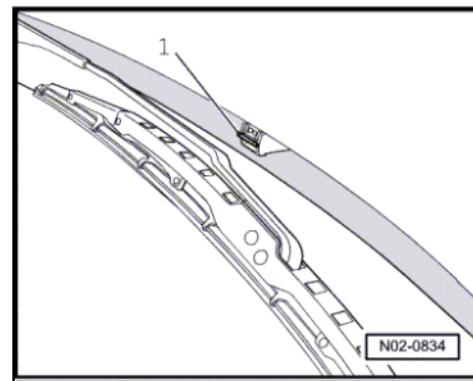
If the two action surfaces of the nozzle jet are not according to the dimensions -nd- and -b-, the jet height must be adjusted as explained below:

- Adjust the jet through the nozzle tab-1- by moving it slightly with your hand, upward or downward, with the front hood closed.



Note

To perform the adjustment, support the nozzle with your hand to prevent it from moving from the housing.





### 3 Rear window wiper system



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the battery earth strap of [page 34](#).*

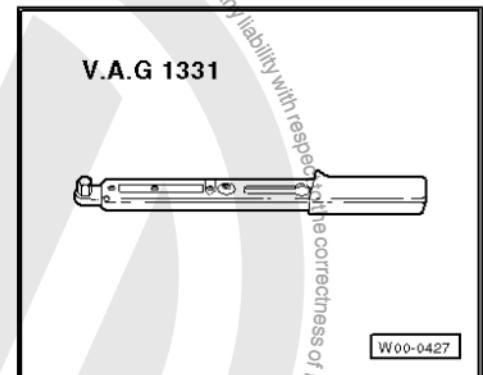


#### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap.*
- ◆ *When the battery is reconnected, check the operation of the vehicle electrical system (radio, clock and electric door and window locks, etc.) according to the Workshop Manual and/or instructions for operation.*

#### Special tools and workshop equipment required

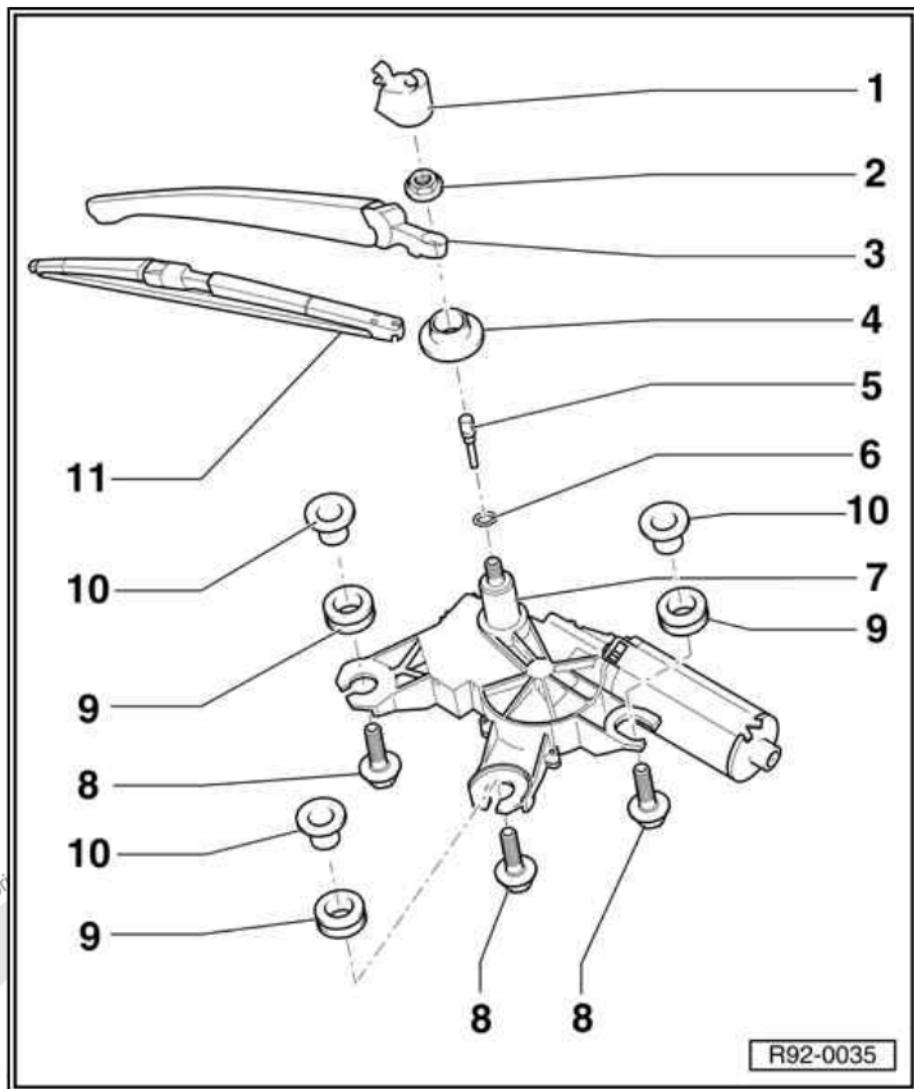
- ◆ *Torque wrench - 5 to 50 Nm (socket 1/2") -VAG 1331-*





### 3.1 Rear window wiper and washer system - assembly overview

- 1 - Protection cover
- 2 - Nut M8
  - 12 Nm
- 3 - Rear window wiper arm
  - Adjust [page 99](#).
- 4 - Sealing eyelet
- 5 - Spray nozzle
  - Replace [page 102](#).
  - Adjust [page 101](#).
- 6 - Seal ring
- 7 - Wiper engine
  - Remove and install [page 99](#).
- 8 - Screw
  - 8 Nm
- 9 - Rubber washer
- 10 - Spacer
- 11 - Wiper blade
  - Remove and install [page 100](#).



### 3.2 Rear window wiper arm - remove and install

#### 3.2.1 Removal

- Raise the protective cover [Item 1 \(page 98\)](#).
- Remove nut M8 [Item 2 \(page 98\)](#).
- Fold the wiper arm and release it by moving the cone side-ward.

#### 3.2.2 Installation

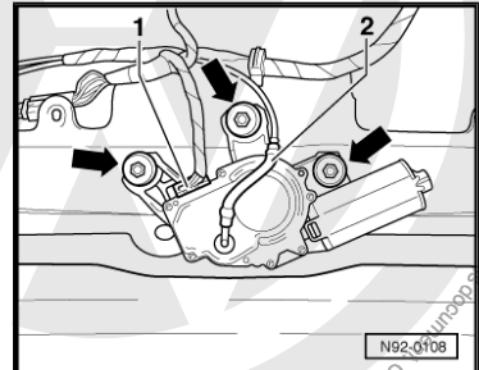
Installation is carried out in the reverse order of removal.



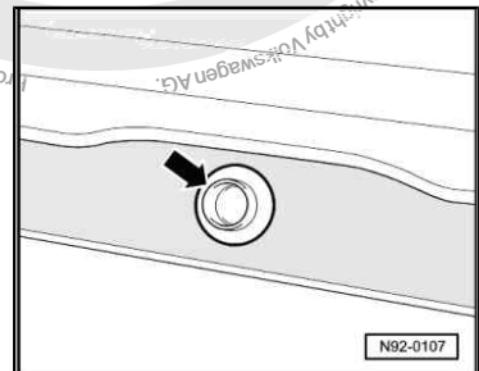
### 3.3 Rear window wiper engine - remove and install

#### 3.3.1 Removal

- Remove rear door lining ⇒ Body - internal mountings; Rep. Gr. 70 ; Rear hatch lining - removal and installation .
- Pull off connector -1- from the rear window wiper motor.
- Release the hose -2- from the spray nozzle.
- Loosen the screws -arrows- and remove rear window wiper motor.



During cleaner motor remover, make sure the seal eyelet -arrow- remains attached to the rear window.



#### 3.3.2 Installation

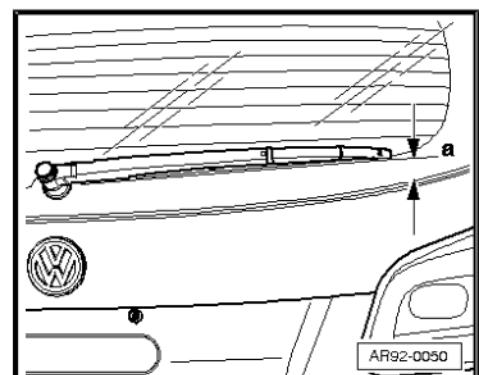
Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
≥ page 104 .

### 3.4 Rear window wiper blade resting position - adjust

The distance -nd- between the rear window wiper rubber blade and the glass lower edge must be 36... 46 mm.

?Tightening torque of the rear window wiper arm fixing nut: 12 Nm.

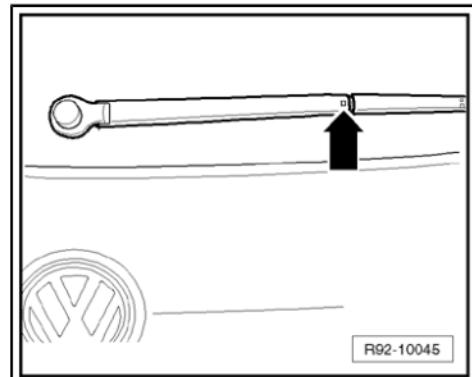




### 3.5 Rear window wiper blade - remove and install

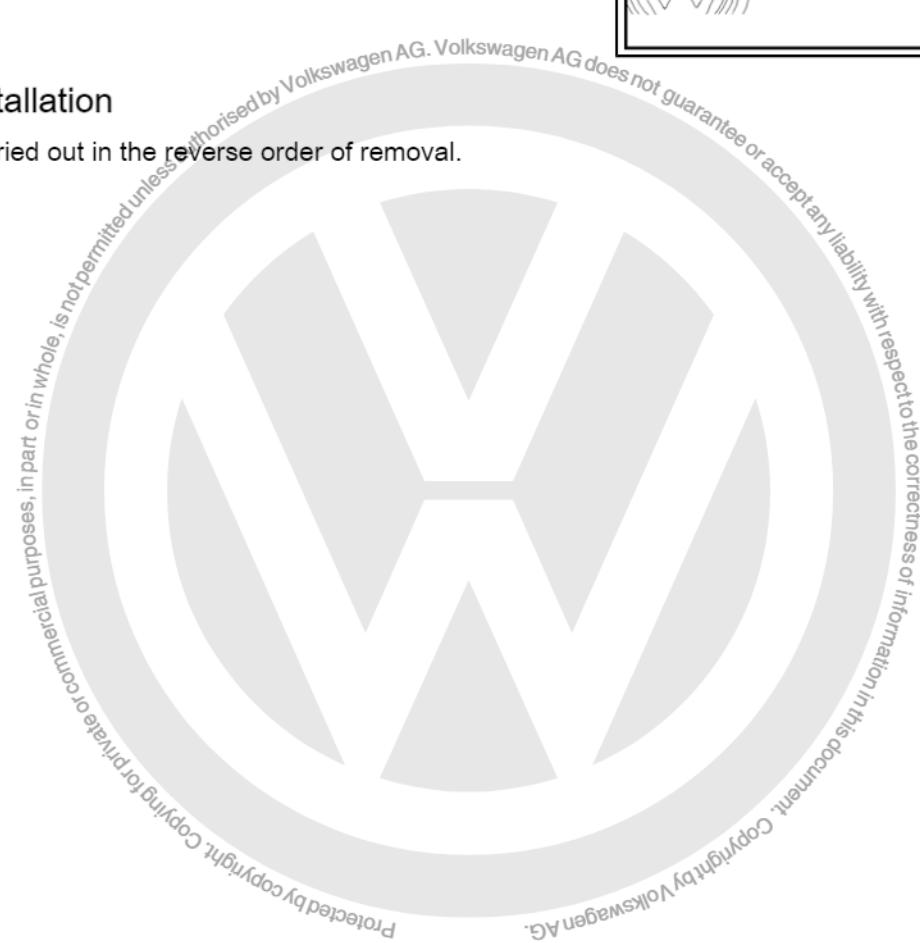
#### 3.5.1 Removal

- Raise the rear window wiper arm.
- Press the blade lock -arrow- and pull it out of the rear window wiper arm, removing it.



#### 3.5.2 Installation

Installation is carried out in the reverse order of removal.





## 4 Rear window washer

### 4.1 Rear window washer - assembly overview

#### 1 - Spray nozzle

- Replace [⇒ page 102](#) .
- Adjust [⇒ page 101](#) .

#### 2 - Connector of Windshield washer pump -V5- and/or Rear window washer pump -V13-

#### 3 - Windshield washer pump -V5- and/or Rear window washer pump -V13-

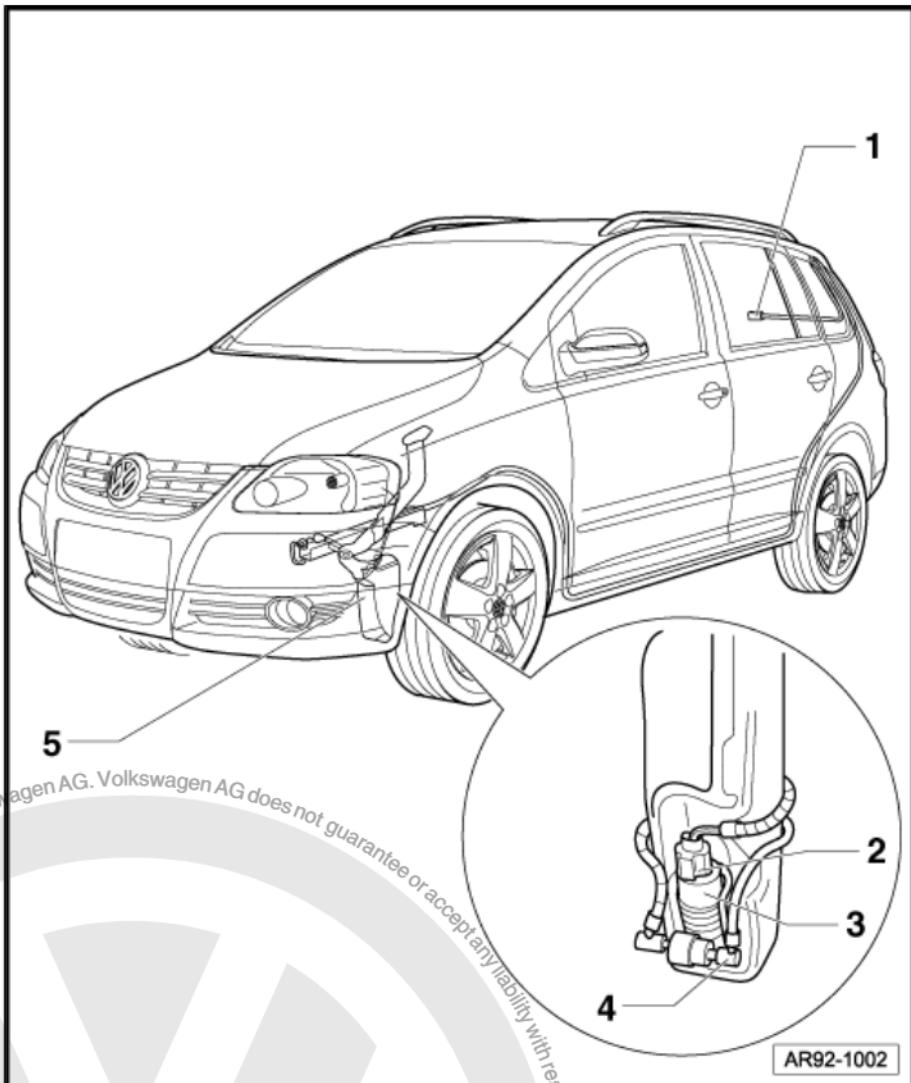
- Remove and install [⇒ page 95](#) .

#### 4 - Rear washer hose

- Connections ⇒ General information; Rep. Gr. 92 ; Windshield wiper and washer, rear window and headlights .
- Repair = General information; Rep. Gr. 92 ; Windshield wiper and washer, rear window and headlights .

#### 5 - Reservoir for the windshield washer system

- Remove and install [⇒ page 94](#) .

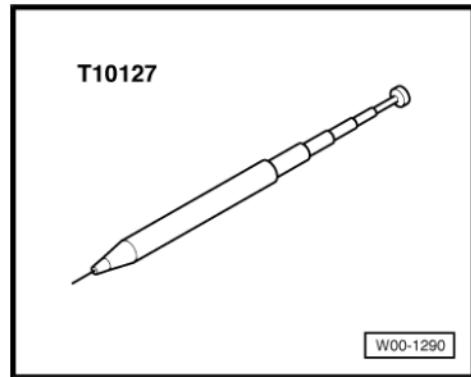


### 4.2 Rear window washer system spray nozzle - adjust

Special tools and workshop equipment required



- ◆ Adjustment device -T 10127-

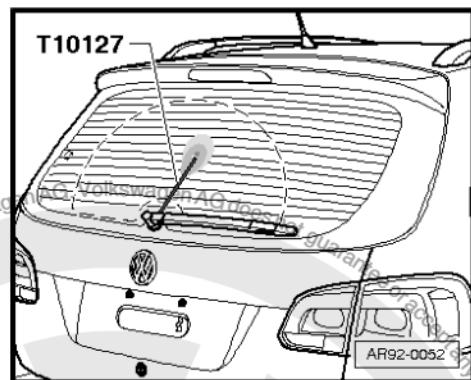


### Note

- ◆ If the spray nozzle jet is irregular or cannot be adjusted to the center of the washer area, the spray nozzle must be replaced (repair measure) [⇒ page 102](#).
- ◆ Under no circumstances should needles or similar objects be used, since this might damage the nozzle's water passage.
- Adjust the spray nozzle so the jet is sprayed to the center of the wiper action area.

The nozzle water jet must fall on the middle of the area to be cleaned.

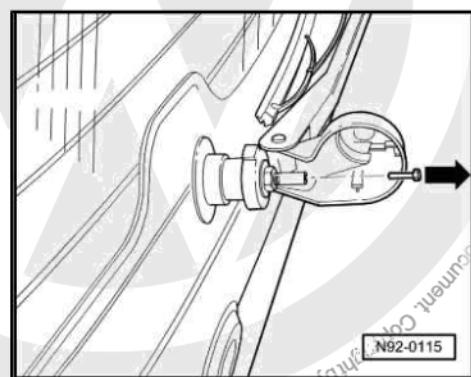
- If necessary, adjust them with the Adjustment device -T 10127-, as indicated.



## 4.3 Spray nozzle - replace

### 4.3.1 Removal

- Place the rear window wiper on the resting position.
- Lift the protection cover.
- Carefully remove the ejector nozzle with appropriate pliers towards the -arrow-.





#### 4.3.2 Installation

- Insert the spray nozzle up to the stop on the wiper shaft, so that the spray nozzle opening faces upwards.
- Lower the protective cover.



## 5 Tightening torque

Location	Tightening torque	
Windshield wiper blade and arm assembly	M 8	17 Nm
Windshield wiper mechanism	M 6	5 Nm
Reservoir for the windshield washer system	M 6	5 Nm
Rear window wiper arm	M 8	12 Nm
Rear windshield wiper motor	M 6	8 Nm





## 94 – Switches, lights and external lamps

### 1 Main headlights - single parabola (up to model-year 2010)

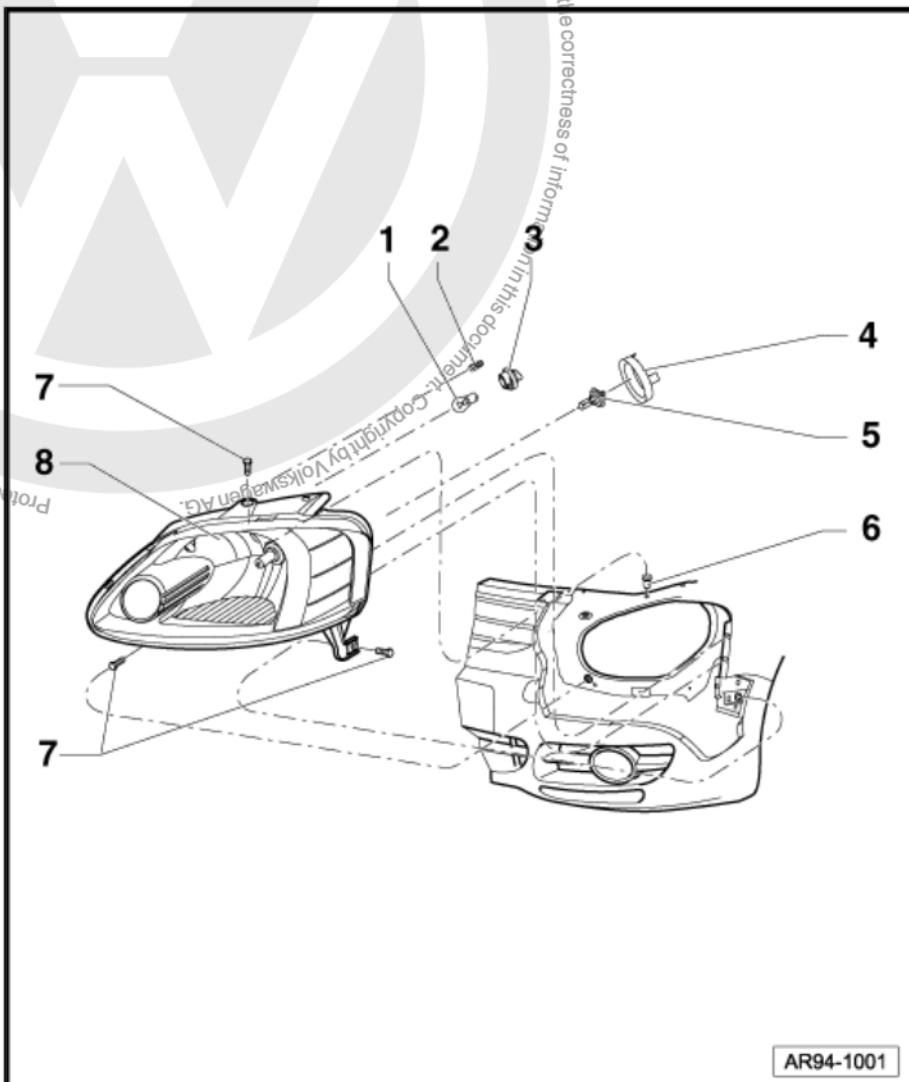
#### 1.1 Main headlights - assembly overview



##### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

- 1 - Turn signal lamp
  - 12 V 21 W incandescent light bulb, yellow glass.
  - Replace [⇒ page 107](#)
- 2 - Position light lamp
  - 12 V 5 W incandescent light bulb.
  - Replace [⇒ page 107](#)
- 3 - Indicator light lamp socket
- 4 - Protection cover
- 5 - High and low beam lamps
  - H4, 12 V 55/60 W incandescent light bulb.
  - Replace [⇒ page 107](#)
- 6 - Hexagon rivet nut
- 7 - Screw
  - 4 Nm
- 8 - Main headlight (single parabola)
  - Adjust [⇒ page 106](#)



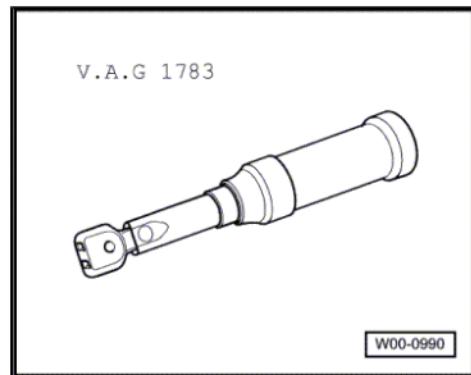
AR94-1001

#### 1.2 Main headlights (single) - remove and install

Special tools and workshop equipment required



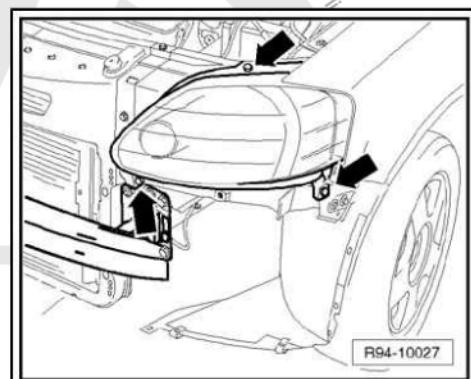
- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



*Removal and installation are described for the left side of the vehicle. Removal and installation on the right side of the vehicle are analogous.*

### 1.2.1 Removal

- Remove front liner ⇒ Body - external mountings; Rep. Gr. 63 ;  
Front bumper - remove and install .
- Remove the attaching screws -arrows-.
- Carefully pull the headlight forward, disconnect the multiple connector and remove the headlight.



### 1.2.2 Install

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
[⇒ page 159](#) .
- Check headlight adjustment [⇒ page 106](#) .

## 1.3 Headlights - adjust



*Use the headlight adjustment equipment to adjust the headlights.  
The nominal values are in Maintenance Manual ⇒ Maintenance ;  
Booklet 22.1 .*

Main right headlight

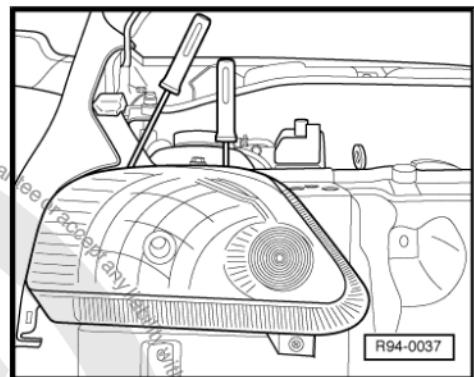


- Adjust the headlights from the front using a proper crosshead screwdriver.

Both adjustment screws on left headlight are symmetrically positioned.



*Please check also if both headlights move symmetrically when positioning the light range.*



## 1.4 Lamps - replace



*Never touch the glass bulb when installing a lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.*

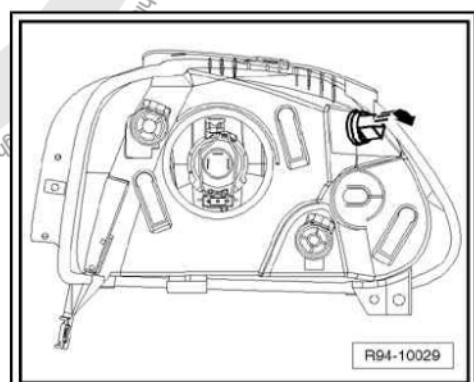
### 1.4.1 Position light bulb - replace

- Disconnect the lamp connector.
- Remove the socket holding the light bulb by turning it -arrow-.
- Remove the lamp from the socket.

Installation is carried out in the reverse order of removal.

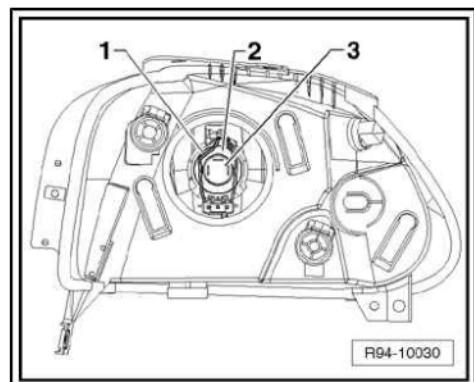
During installation, watch that the lamp socket fits completely.

- After installing a new lamp, check its operation.



### 1.4.2 High and low beam lamp - replace

- Disconnect the lamp connector.
- Remove the protection cover.
- Insert lock ring -1- from socket -2-.
- Remove lamp -3- from reflector.
- Do not touch the glass bulb while installing it.
- Install the lamp on the reflector.
- Fit the lock ring.
- Fit the connector.
- Install the protection cover.
- After installing a new lamp, check its operation.
- Check headlight adjustment ➔ [page 106](#) .



### 1.4.3 Turn signal lamp - replace

- Disconnect the connector.



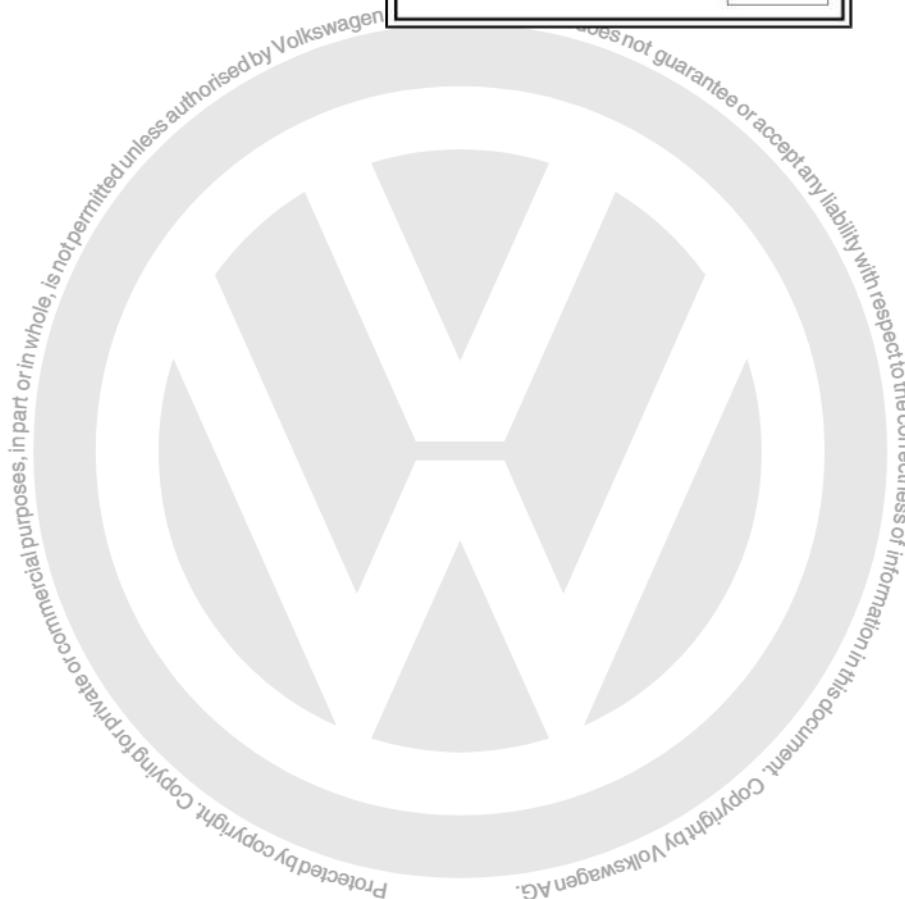
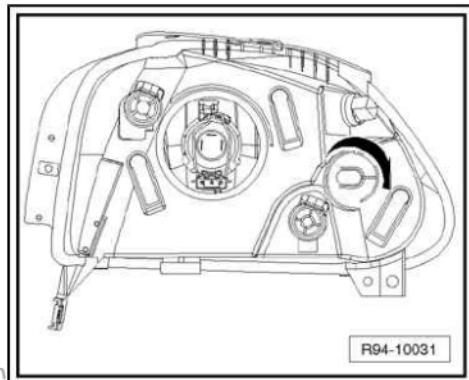
- Remove the socket -arrow-.
- Remove the lamp.

Installation is carried out in the reverse order of removal.



*During installation, watch that the lamp socket fits completely.*

- After installing a new lamp, check its operation.





## 2 Main headlights - double parabola (up to model-year 2010)

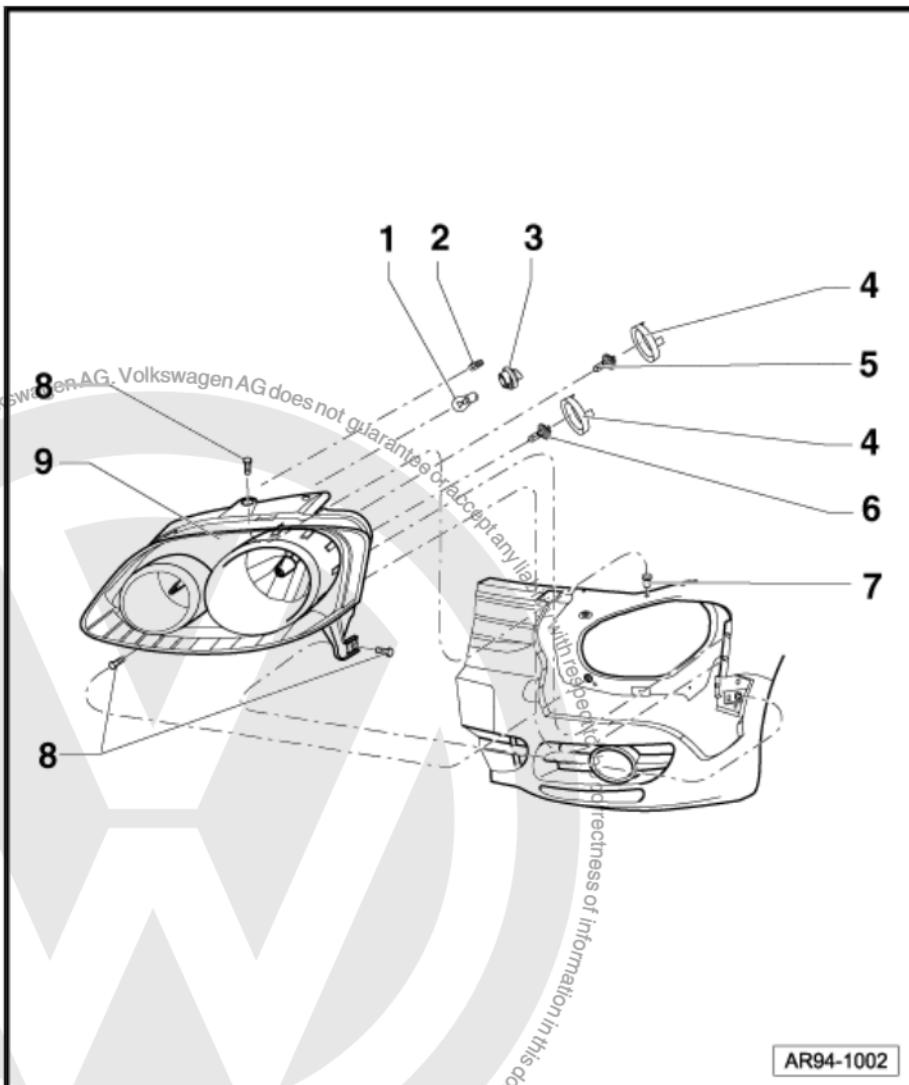
### 2.1 Main headlights (double parabola) - assembly overview



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the battery earth strap of [page 34](#).*

- 1 - Turn signal lamp
  - 12 V 21 W incandescent light bulb.
  - Replace [page 112](#)
- 2 - Position light lamp
  - 12 V 5 W incandescent light bulb.
  - Replace [page 111](#)
- 3 - Indicator light lamp socket
- 4 - Protection cover
- 5 - High beam light bulb
  - 12 V 60 W incandescent light bulb.
  - Replace [page 111](#)
- 6 - Headlight bulb
  - Incandescent lamp 12 V 55 W
  - Replace [page 111](#)
- 7 - Hexagon rivet nut
- 8 - Screw
  - 4 Nm
- 9 - Main headlight (double parabola)
  - Adjust [page 110](#)



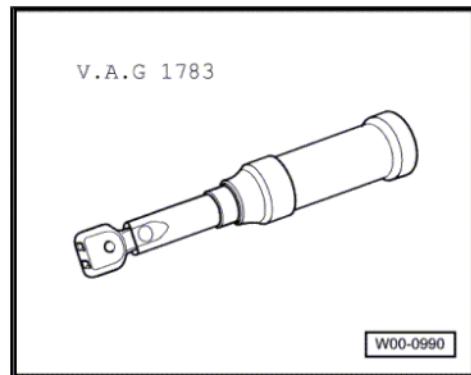
AR94-1002

### 2.2 Main headlights (double parabola) - remove and install

Special tools and workshop equipment required



- ◆ Torque wrench 2 to 10 Nm -VAG 1783-

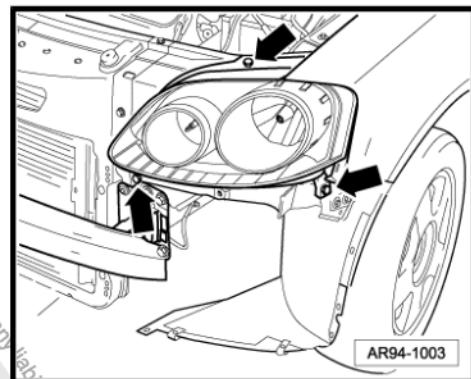


#### Note

Removal and installation are described for the left side of the vehicle. Removal and installation on the right side of the vehicle are analogous.

### 2.2.1 Removal

- Remove front liner ⇒ Body - external mountings; Rep. Gr. 63 ;  
Front bumper - remove and install .
- Remove the attaching screws -arrows-.
- Carefully pull the headlight forward, disconnect the multiple connector and remove the headlight.



### 2.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
⇒ [page 159](#) .
- Check headlight adjustment ⇒ [page 110](#) .

### 2.3 Headlights - adjust



#### Note

Use the headlight adjustment equipment to adjust the headlights.  
The nominal values are in Maintenance Manual ⇒ Maintenance ;  
Booklet 22.1 .

Main right headlight

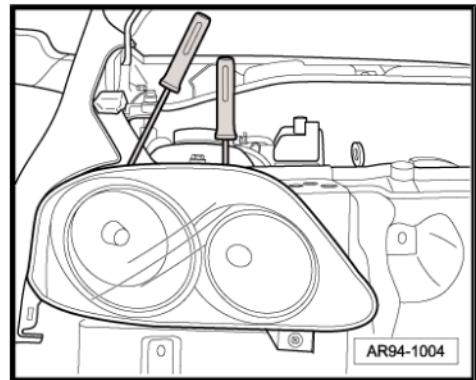


- Adjust the headlights from the front using a proper crosshead screwdriver.

Both adjustment screws on left headlight are symmetrically positioned.



*Please check also if both headlights move symmetrically when positioning the light range.*



## 2.4 Lamps - replace



*Never touch the glass bulb when installing a lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.*

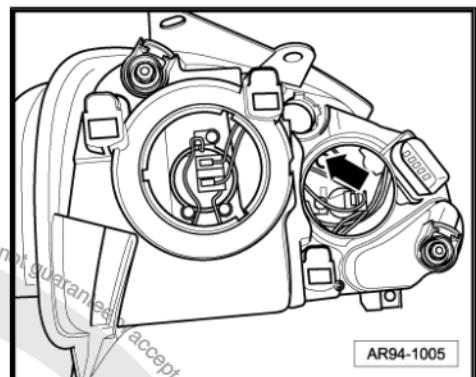
### 2.4.1 Position light bulb - replace

- Remove the protection cover.
- Disconnect the lamp connector -arrow-
- Remove the socket holding the light bulb by turning it.
- Remove the lamp from the socket.

Installation is carried out in the reverse order of removal.

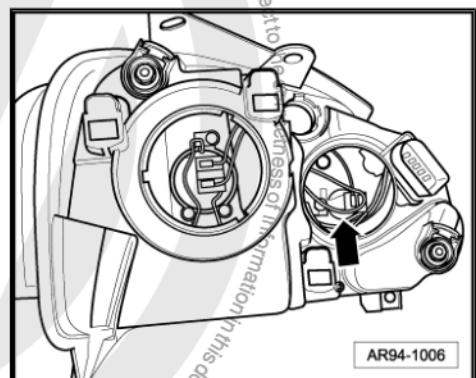
During installation, watch that the lamp socket fits completely.

- After installing a new lamp, check its operation.



### 2.4.2 Renewing main beam bulb

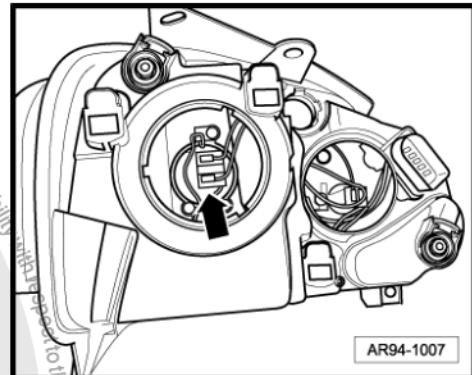
- Remove the protection cover.
- Disconnect the lamp connector.
- Release the lock ring from the socket -arrow-.
- Pull bulb out of housing.
- Do not touch the glass bulb while installing it.
- Install the lamp on the reflector.
- Fit the lock ring.
- Fit the connector.
- Install the protection cover.
- After installing a new lamp, check its operation.
- Check headlight adjustment [⇒ page 110](#).





## 2.4.3 Renewing dipped beam bulb

- Disconnect the lamp connector.
- Remove the protection cover.
- Release the lock ring from the socket -arrow-.
- Pull bulb out of housing.
- Do not touch the glass bulb while installing it.
- Install the lamp on the reflector.
- Fit the lock ring.
- Fit the connector.
- Install the protection cover.
- After installing a new lamp, check its operation.
- Check headlight adjustment [⇒ page 110](#) .



## 2.4.4 Turn signal lamp - replace

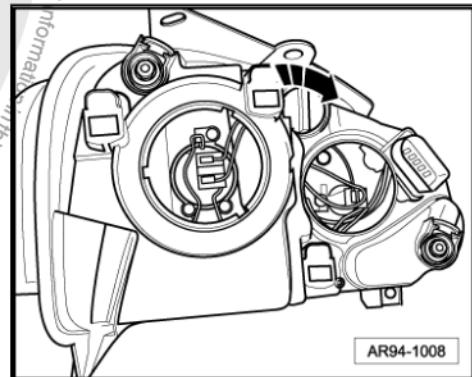
- Disconnect the connector.
- Remove the socket -arrow-.
- Remove the lamp.

Installation is carried out in the reverse order of removal.



*During installation, watch that the lamp socket fits completely.*

- After installing a new lamp, check its operation.





### 3 Main headlights (up from model-year 2011)



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

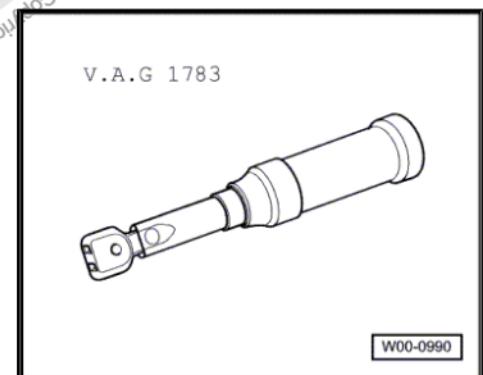


#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A-.
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-





### 3.1 Main headlights - assembly overview

1 - Main headlight (single)

- Remove and install  
[⇒ page 115](#)
- Check adjustment  
[⇒ page 134](#)

2 - Main headlight (twin)

- Remove and install  
[⇒ page 116](#)
- Check adjustment  
[⇒ page 134](#)

3 - Bushing

4 - Screw

- 3 Nm

5 - Left high beam lamp -M30- and/or Right high beam lamp -M32-

- Halogen lamp H1, 12 V - 55 W.
- Replace [⇒ page 120](#)

6 - Protection cover

7 - Left front sidelight lamp -M1- and/or Right front sidelight lamp -M3-

- Incandescent lamp 12 V - 5 W.
- Replace [⇒ page 119](#)

8 - Position light socket

- Twin Headlight.

9 - Left front indicator light lamp -M5- and/or Right front indicator light lamp -M7-

- Incandescent lamp PY21W - 12V.
- Replace [⇒ page 118](#)

10 - Indicator light lamp socket

11 - Left low beam lamp -M29- and/or Right low beam lamp -M31-

- Halogen lamp H7, 12 V - 55 W.
- Replace [⇒ page 119](#)

12 - Indicator light lamp socket

13 - Left front indicator light lamp -M5- and/or Right front indicator light lamp -M7-

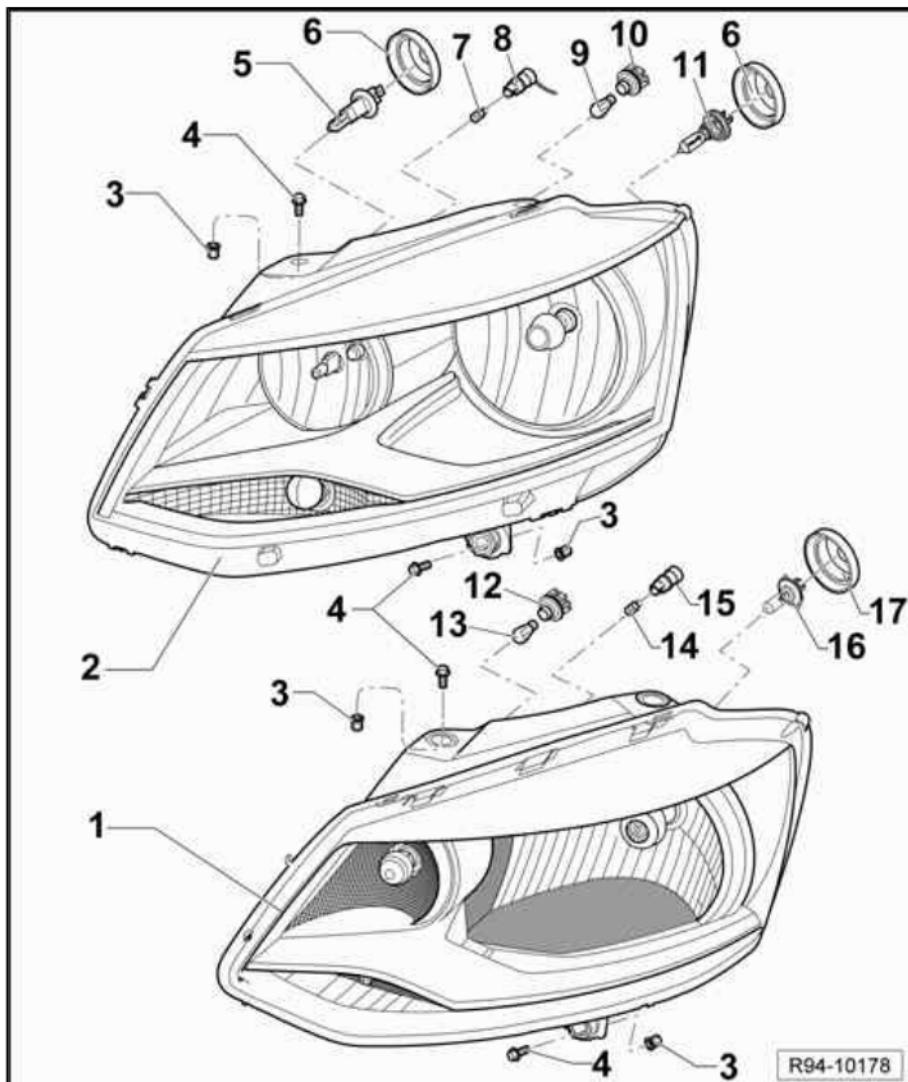
- Incandescent lamp PY21W - 12V.
- Replace [⇒ page 118](#)

14 - Left front sidelight lamp -M1- and/or Right front sidelight lamp -M3-

- Incandescent lamp 12 V - 5 W.
- Replace [⇒ page 117](#)

15 - Position light socket

- Single Headlight.



R94-10178



16 - Left low beam lamp -M29- and Left high beam lamp -M30- and/or Right low beam lamp -M31- and Right high beam lamp -M32-

- Halogen lamp H4, 55/60 W - 12V.
- Replace [⇒ page 117](#)

17 - Protection cover

### 3.2 Main headlights (single parabola) - remove and install

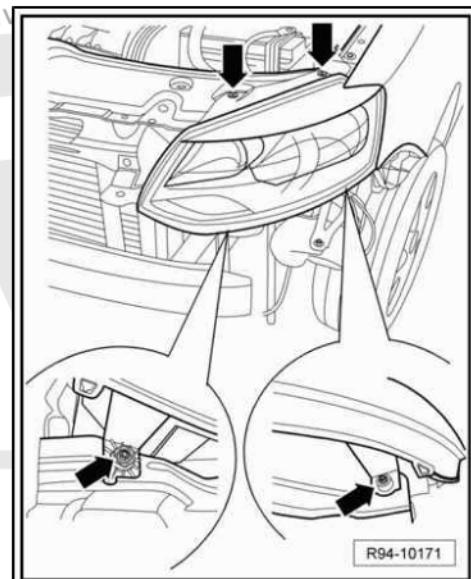
#### 3.2.1 Removal



##### Note

*Removing and installing main headlights is identical on both sides; the procedure below refers only to one of the headlights.*

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove front bumper ⇒ Body - external mountings; Rep. Gr. 63 ; bumpers .
- Remove the attaching screws -arrows-.
- Carefully pull the headlight forwards, disconnect the multiple connector and remove the headlight from its housing.

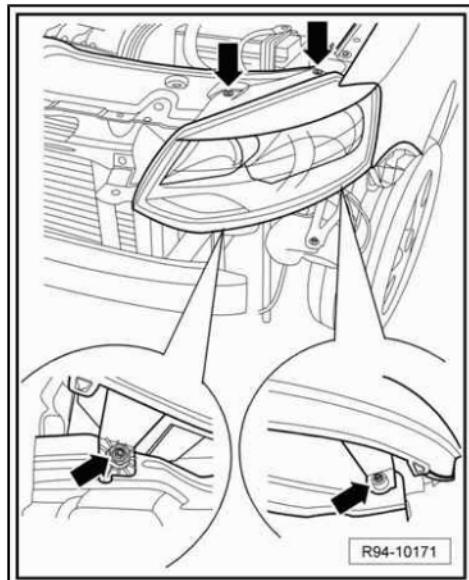


#### 3.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:



- Tighten the fastening screws-arrows- with a torque of 3 Nm.
- After installation, check main headlight functioning.
- Check and, if necessary, carry out main headlight adjustment  
⇒ [page 134](#) .



### 3.3 Main headlights (double parabola) - remove and install

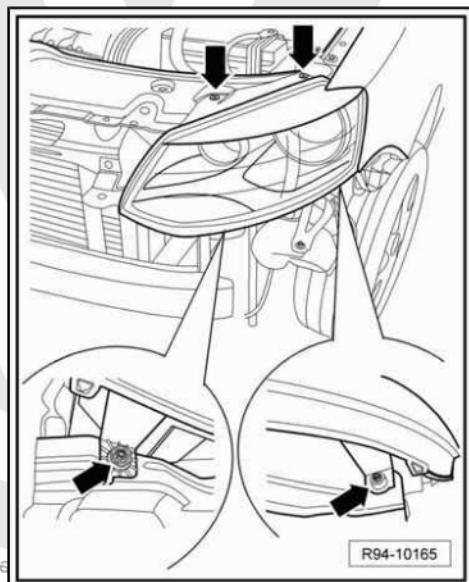
#### 3.3.1 Removal



##### Note

*Removing and installing main headlights is identical on both sides; the procedure below refers only to one of the headlights.*

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- ⇒ [page 34](#) .
- Remove front bumper ⇒ Body - external mountings; Rep. Gr. 63 ; bumpers .
- Remove the attaching screws -arrows-.
- Carefully pull the headlight forwards, disconnect the multiple connector and remove the headlight from its housing.

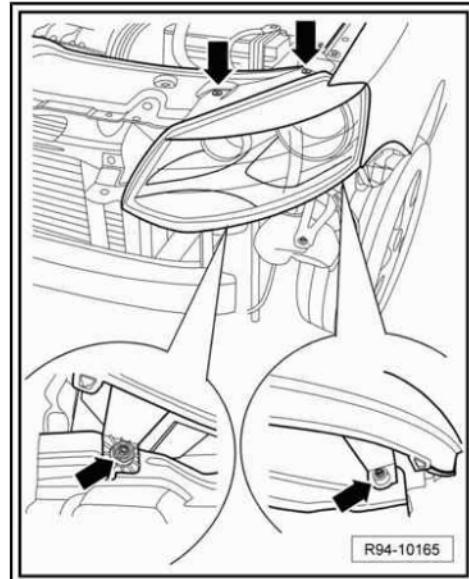




### 3.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screws-arrows- with a torque of 3 Nm.
- After installation, check main headlight functioning.
- Check and, if necessary, carry out main headlight adjustment  
⇒ [page 134](#).



## 3.4 Main headlight lamps (single parabola) - replace



### Note

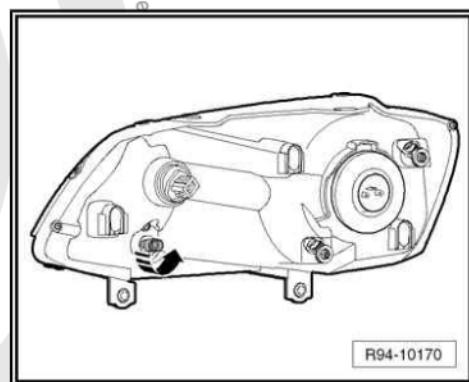
- ◆ Never touch the glass bulb when installing a lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.
- ◆ Replacing main headlight lamps is identical on both sides; the procedure below refers only to one of the headlights.

### 3.4.1 Left front sidelight lamp -M1- and/or Right front sidelight lamp -M3- - replace

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- ⇒ [page 34](#).
- Disconnect socket connector.
- Remove the socket with lamp by turning it towards -arrow-.
- Remove the lamp.
- Install new lamp in the socket.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.



### 3.4.2 Left low beam lamp -M29- and Left high beam lamp -M30- and/or Right low

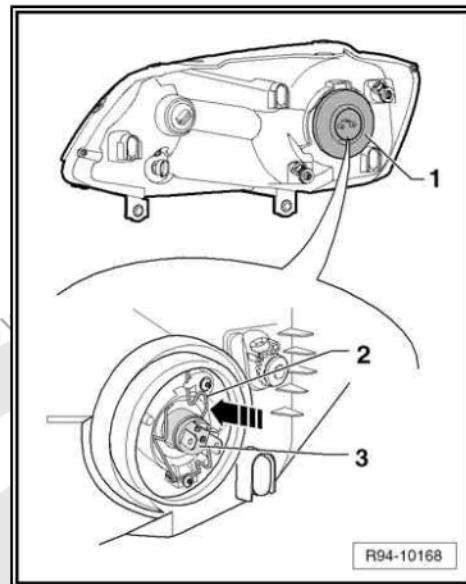


### beam lamp -M31- and Right high beam lamp -M32- - replace

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Disconnect the lamp connector.
- Remove the protection cover-1-.
- Loosen circlip -2- by pressing it according to -arrow- and carefully remove the lamp -3- from reflector.
- Install a new lamp.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.
- Check and, if necessary, carry out the headlight adjustment [⇒ page 134](#) .

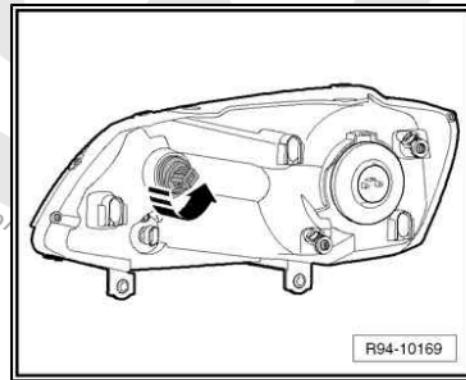


### 3.4.3 Left front indicator light lamp -M5- and/ or Right front indicator light lamp -M7- - replace

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Disconnect the socket connector.
- Remove the socket with lamp by turning it towards -arrow-.
- Remove the lamp from the socket.
- Install new lamp in the socket.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.





### 3.5 Main headlight lamps (double parabola) - replace



#### Note

- ◆ *Never touch the glass bulb when installing a lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.*
- ◆ *Replacing main headlight lamps is identical on both sides; the procedure below refers only to one of the headlights.*

#### 3.5.1 Left front sidelight lamp -M1- and/or Right front sidelight lamp -M3- - replace

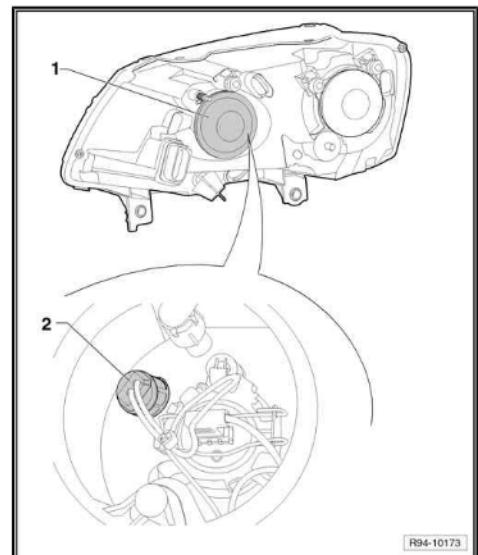
- Turn the ignition and all electric components off and remove the key from the ignition.

- Disconnect the Battery -A- [page 34](#).

- Remove the protection cover -1-.
- Carefully remove socket with lamp -2- from reflector.
- Remove the lamp.
- Install new lamp in the socket.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.



#### 3.5.2 Left low beam lamp -M29- and/or Right low beam lamp -M31- - replace

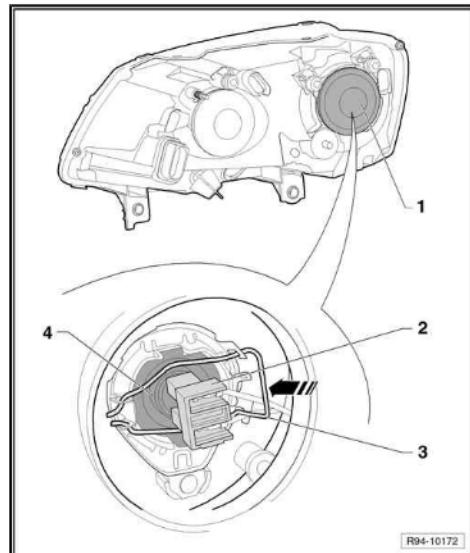
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [page 34](#).
- Remove the protection cover-1-.
- Disconnect the lamp connector.-2-.



- Loosen circlip -3- by pressing it according to -arrow- and carefully remove the lamp -4- from reflector.
- Install a new lamp.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.
- Check and, if necessary, carry out the headlight adjustment  
[⇒ page 134](#).

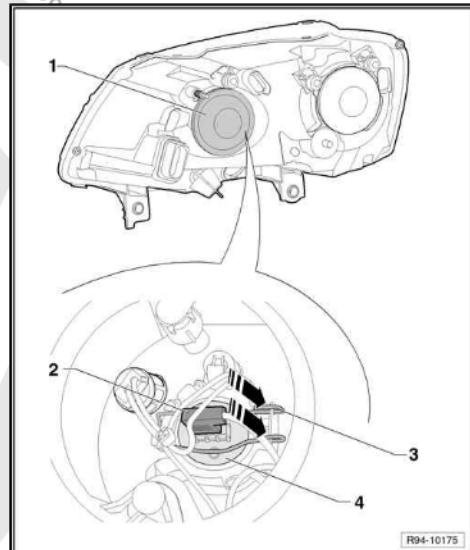


### 3.5.3 Left high beam lamp -M30- and/or Right high beam lamp -M32- - replace

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove the protection cover -1-
- Disconnect the lamp connector -2-
- Loosen circlip -3- by pressing it according to -arrow- and carefully remove the lamp -4- from reflector.
- Install a new lamp.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.
- Check and, if necessary, carry out the headlight adjustment  
[⇒ page 134](#).



### 3.5.4 Left front indicator light lamp -M5- and/or Right front indicator light lamp -M7- - replace

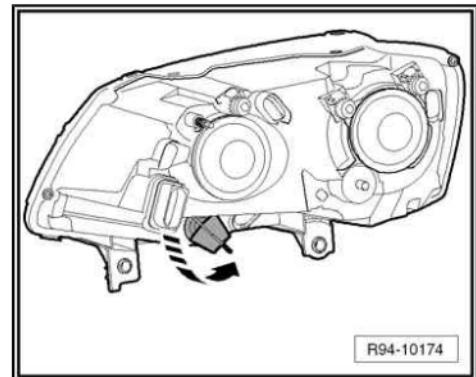
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).



- Remove the socket with lamp by turning it towards -arrow-.
- Remove the lamp from the socket.
- Install new lamp in the socket.

Install by inverting the removal sequence, paying attention to the following:

- After installation, check if the light works.

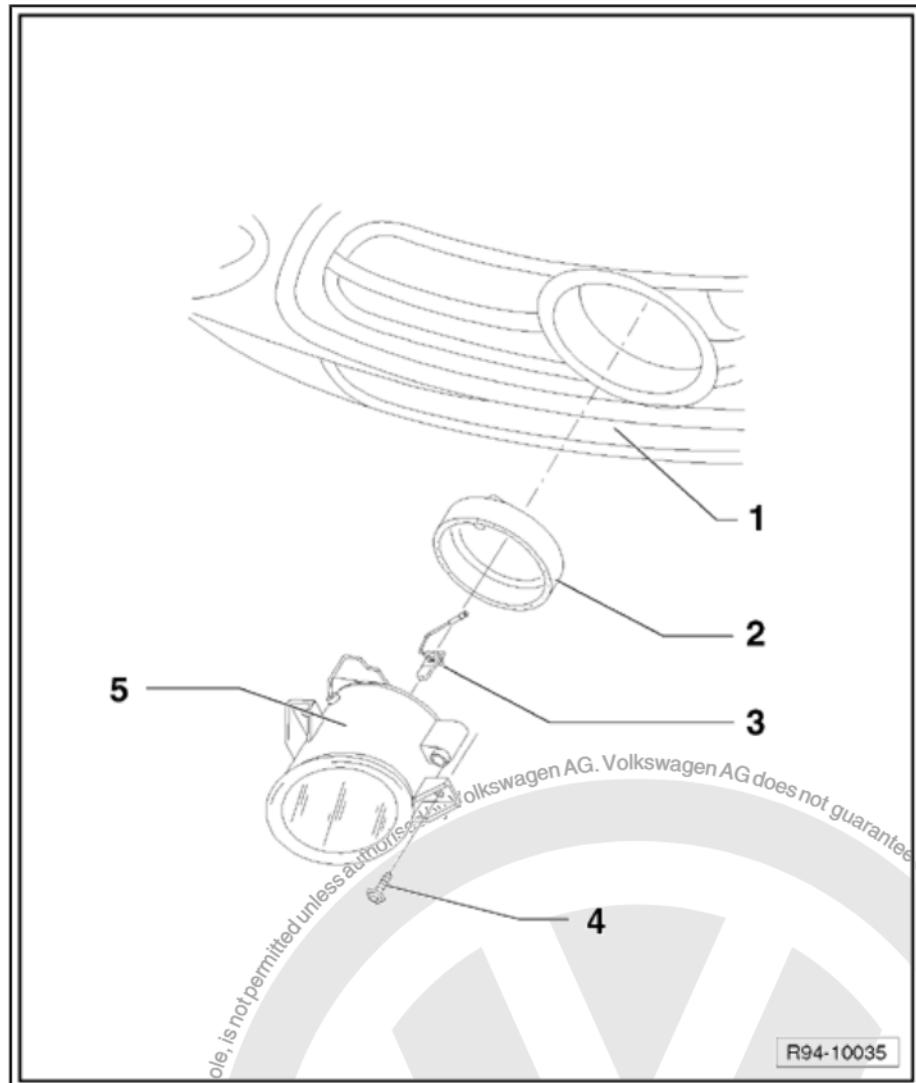




## 4 Fog headlights (up to model-year 2010)

### 4.1 Fog headlights - assembly overview

- 1 - Front protection
- 2 - Protection cover
- 3 - Fog headlight lamp
  - H3, 12 V 55 W halogen light bulb.
  - Replace [⇒ page 123](#).
- 4 - Screw
  - 2 Nm
- 5 - Fog headlight
  - Remove and install [⇒ page 122](#).



### 4.2 Fog lights - remove and install



Note

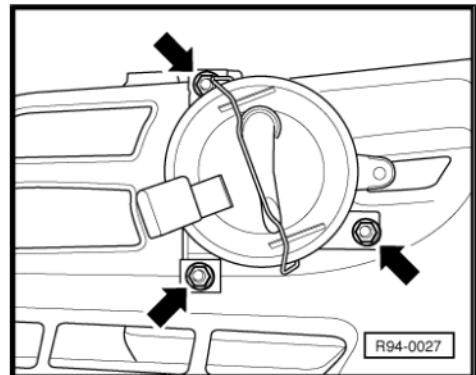
*Removal and installation are described for the right side of the vehicle. Removal and installation on the left side of the vehicle are analogous.*

#### 4.2.1 Removal

- Remove front bumper ⇒ Body - external mountings; Rep. Gr. 63 ; Front bumper - remove and install .
- Disconnect the connector from fog headlight.



- Remove the attaching screws -arrows-.
- Remove the fog headlight.



#### 4.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
[⇒ page 159](#).

#### 4.3 Fog headlight lamp - replace

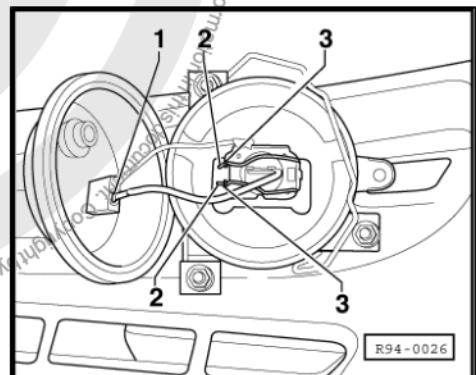
##### 4.3.1 Removal



###### Note

*Do not touch the glass bulb of the halogen lamp.*

- Disengage the lock ring and remove the protection cover.
- Disconnect the connector from halogen bulb H3 -1-.
- Press spring ring -2- on retention protrusion -3- and open.
- Remove the lamp from the reflector.



##### 4.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Install the lamp so that the groove on the lamp socket aligns with the salience guide of the reflector.
- After installing a new lamp, check its operation.



## 5 Fog headlights (up from model-year 2011)



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*



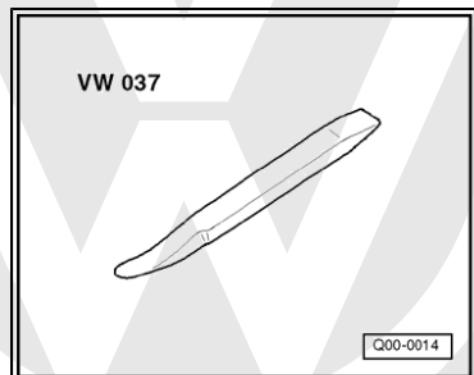
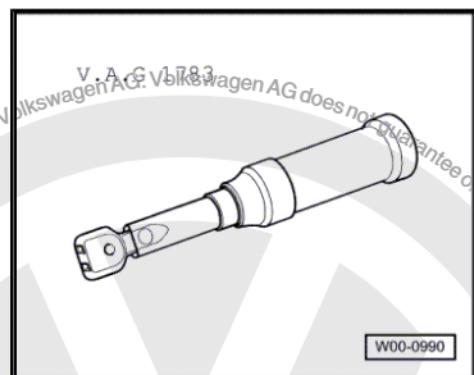
### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-

- ◆ Spatula -VW 037-





## 5.1 Fog headlights - assembly overview

1 - Cover

2 - Fog headlight

- Remove and install  
⇒ [page 125](#)
- Check adjustment  
⇒ [page 136](#)

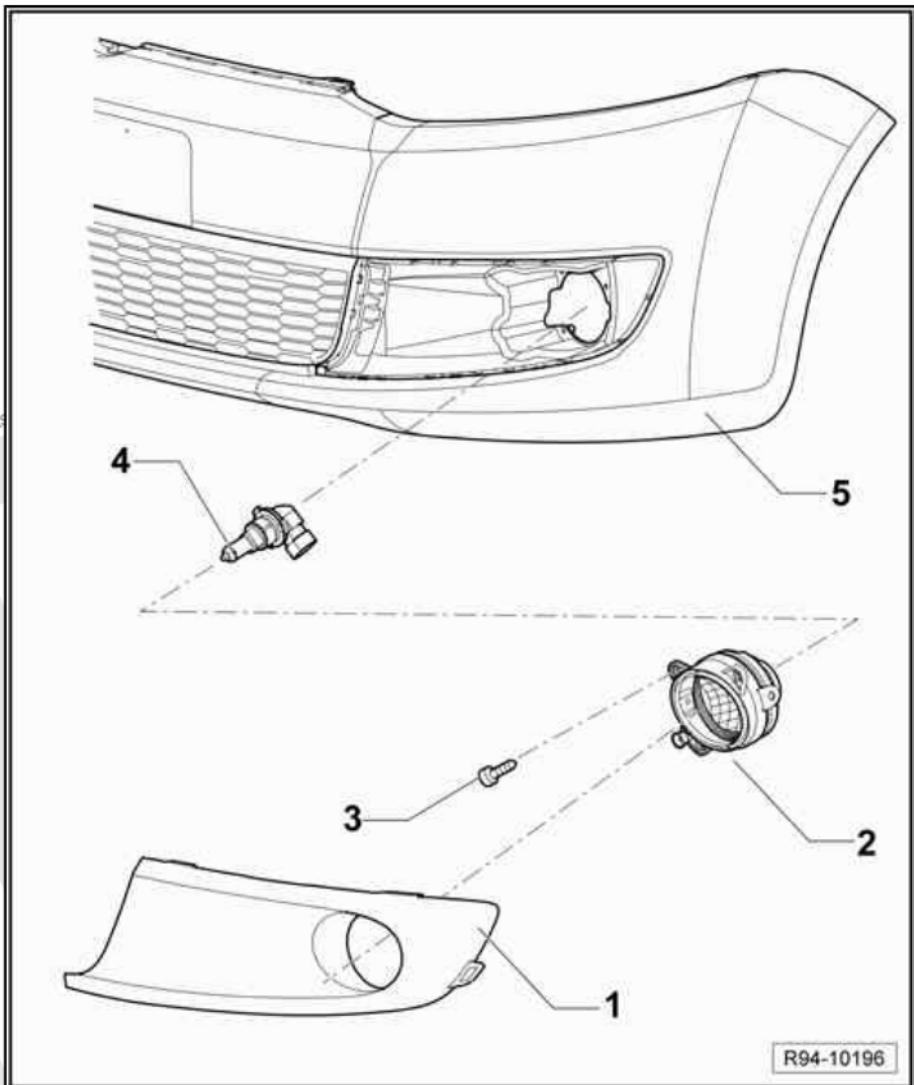
3 - Fixing screw

- 3 units
- 1.5 Nm

4 - Left fog light lamp -L22-  
and/or Right fog light lamp -  
L23-

- Halogen lamp HB4 (12V  
- 51W)
- Replace

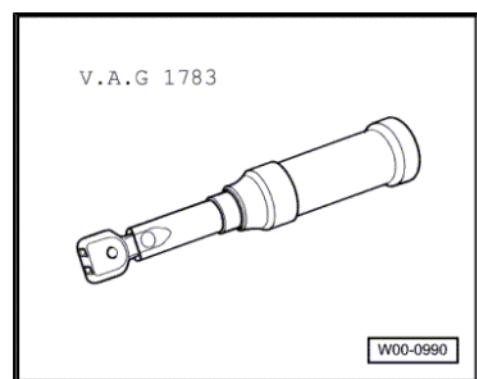
5 - Front bumper



## 5.2 Fog lights - remove and install

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-





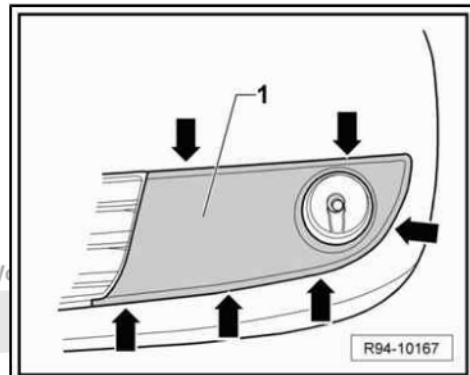
## 5.2.1 Removal



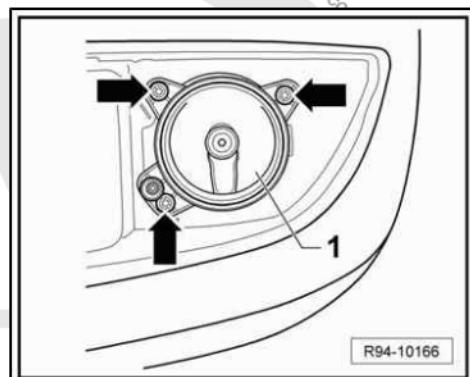
### Note

The removal and installation of fog lights is identical on both sides; the procedure below refers only to one of the sides.

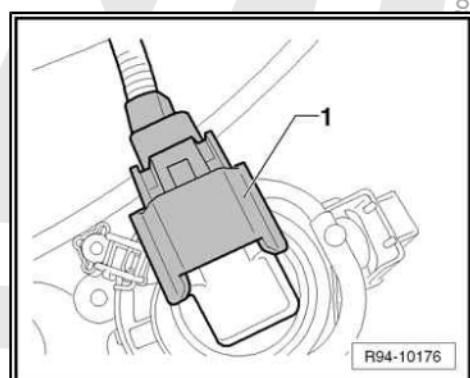
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Release the cover -1- with an Spatula -VW 037- in the fastening points -arrows-, releasing it from the bumper cover.



- Loosen the fastening screws -arrows- from fog light -1-.
- Remove the fog light from the bumper cover by pulling them forward, following the cable length.



- Loosen and disconnect the connector -1-.
- Remove the fog light.

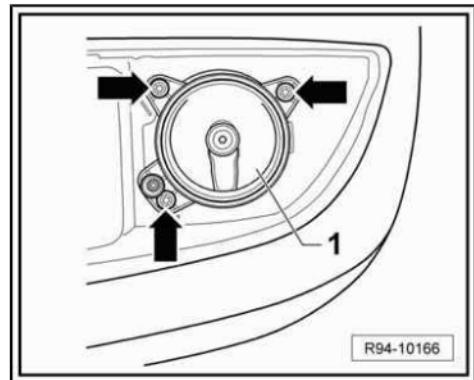


## 5.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:



- Tighten the fastening screws -arrows- with a torque of 1.5 Nm.
- After installation, check the fog light functioning.
- Check and, when necessary, carry out the fog light adjustment  
[⇒ page 134](#) .



R94-10166

### 5.2.3 Left fog light lamp -L22- and/or Right fog light lamp -L23- - replace

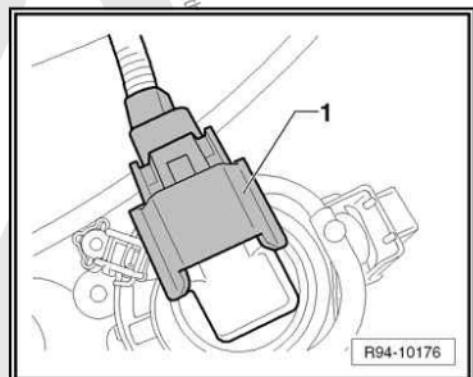


#### Note

- ◆ The removal and installation of fog light lamps is identical on both sides; the procedure below refers only to one of the fog lights.
- ◆ Never touch the glass bulb when installing a new lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.

#### Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Pull off connector -1-.



R94-10176

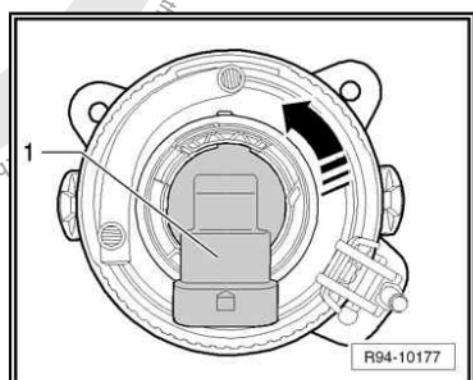
- Turn the socket along with the fog light lamp -1- in the direction of arrow and remove the fog light.

The fog light lamp is fastened to the lamp shell, and cannot be replaced individually.

#### Installation:

Install by inverting the removal sequence, paying attention to the following:

- After installation, check the fog light functioning.
- Check and, if necessary, carry out the fog light adjustment  
[⇒ page 134](#) .



R94-10177



## 6 Fog lights (Suran Cross/Space Cross models)



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

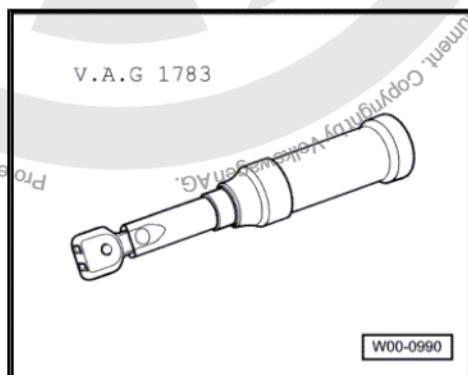


### Note

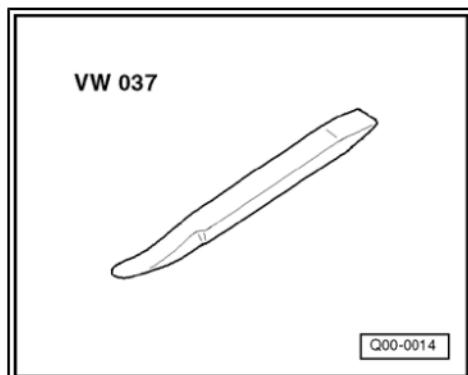
- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



- ◆ Spatula -VW 037-





## 6.1 Fog headlights - assembly overview

1 - Cover

2 - Fog headlight

Remove and install  
[⇒ page 125](#)

Check adjustment  
[⇒ page 136](#)

3 - Fixing screw

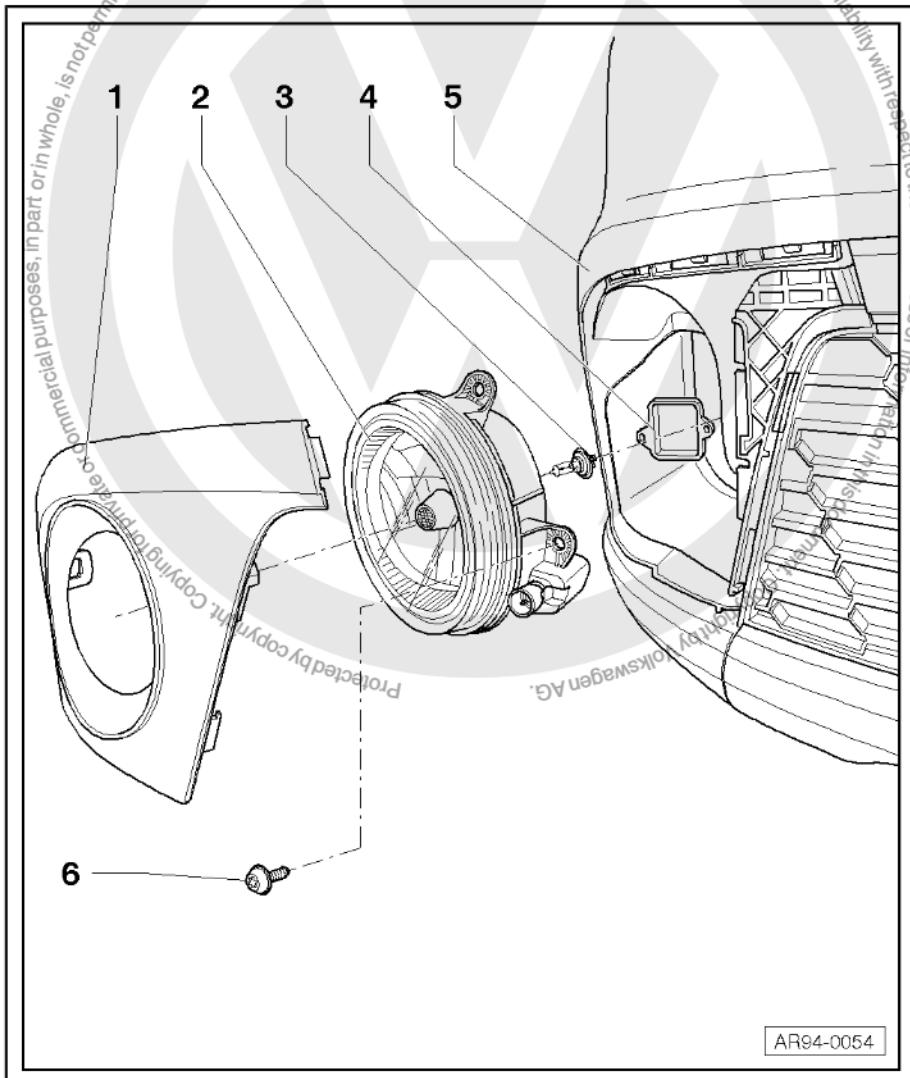
3 units  
 1.5 Nm

4 - Left fog light lamp -L22-  
 and/or Right fog light lamp -  
 L23-

Halogen lamp HB4 (12V  
 - 51W)  
 Replace

5 - Protection cover

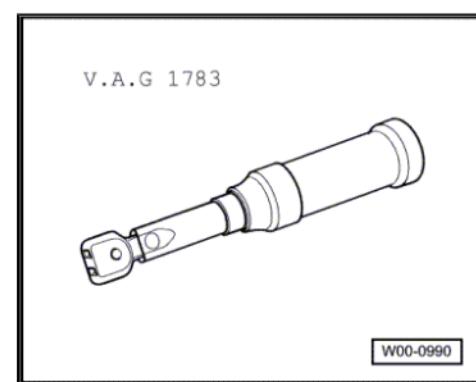
6 - Front bumper



## 6.2 Fog lights - remove and install

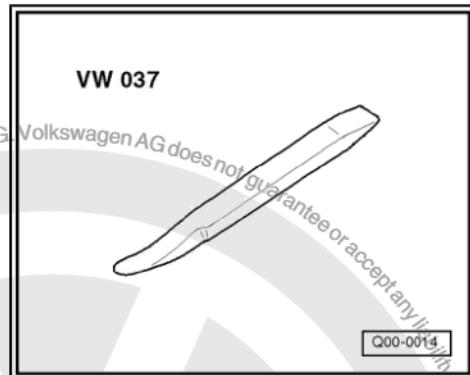
Special tools and workshop equipment required

◆ Torque wrench 2 to 10 Nm -VAG 1783-





- ◆ Spatula -VW 037-

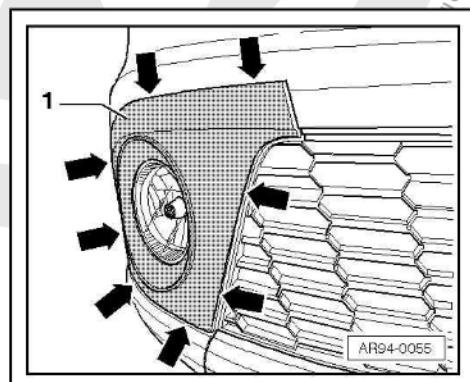


## 6.2.1 Removal

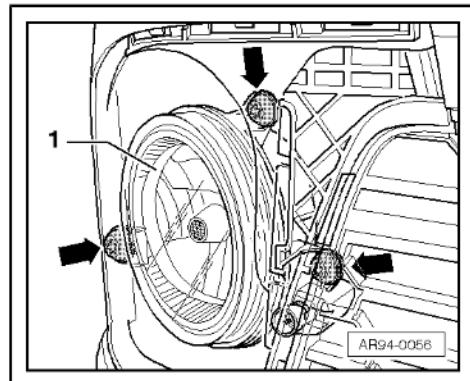


*The removal and installation of fog lights is identical on both sides; the procedure below refers only to one of the sides.*

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Release the cover -1- with an Spatula -VW 037- in the fastening points -arrows-, releasing it from the bumper cover.

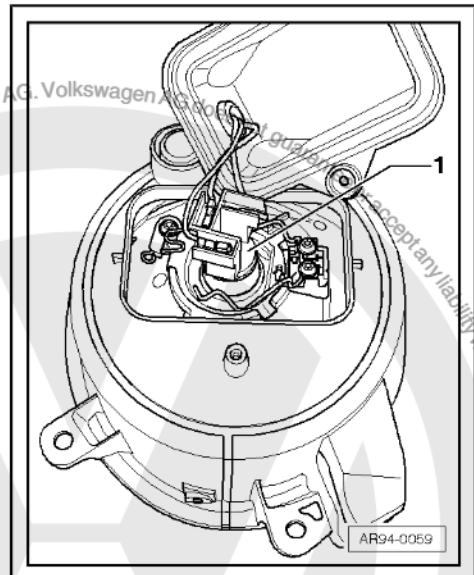


- Loosen the fastening screws -arrows- from fog light -1-.
- Remove the fog light from the bumper cover by pulling them forward, following the cable length.





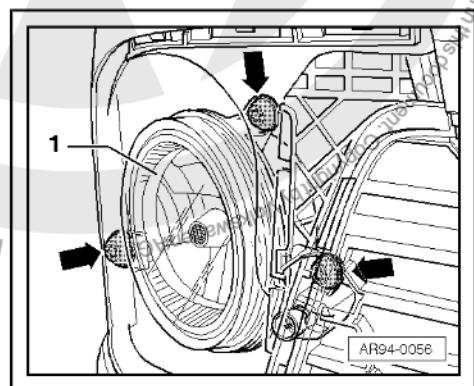
- Pull off connector -1- of Left fog light lamp -L22- and/or Right fog light lamp -L23- and remove the fog light.



## 6.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screws -arrows- with a torque of 1.5 Nm.
- After installation, check the fog light functioning.
- Check and carry out the fog light adjustment [⇒ page 134](#) .



## 6.3 Left fog light lamp -L22- and/or Right fog light lamp -L23- - replace



### Note

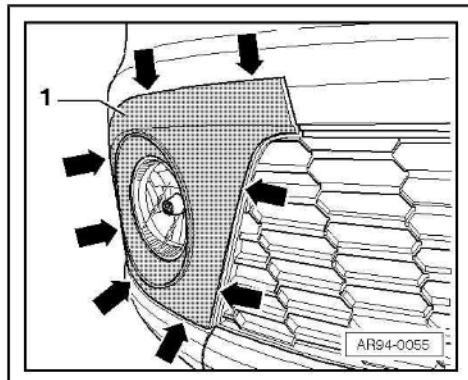
- ◆ *The removal and installation of fog light lamps is identical on both sides; the procedure below refers only to one of the fog lights.*
- ◆ *Never touch the glass bulb when installing a new lamp. Fingers leave traces of fat on the glass bulb, which evaporate when the lamp is turned on, causing the glass to cloud over.*

## 6.3.1 Removal

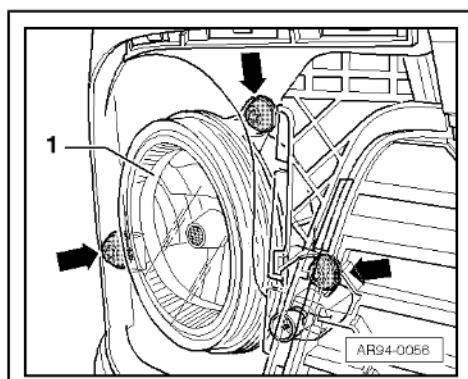
- Turn the ignition and all electric components off and remove the key from the ignition.
- Remove the fog headlights [⇒ page 125](#) .



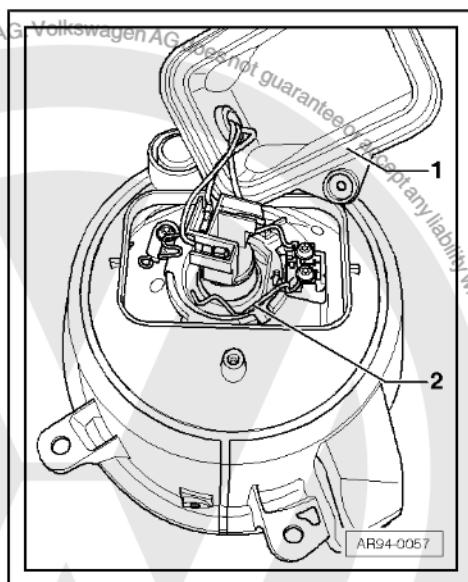
- Release the cover -1- with an Spatula -VW 037- in the fastening points -arrows-, releasing it from the bumper cover.



- Loosen the fastening screws -arrows- from fog light -1-.

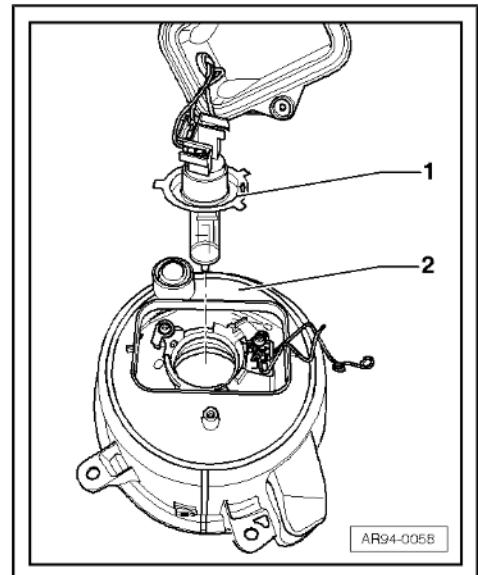


- Pull off connector -1-.





- Remove Left fog light lamp -L22- and/or Right fog light lamp - L23- -1- from the fog headlights housing -2-.



### 6.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- After installation, check the fog light functioning.
- Check and, if necessary, carry out the fog light adjustment  
[⇒ page 134](#) .

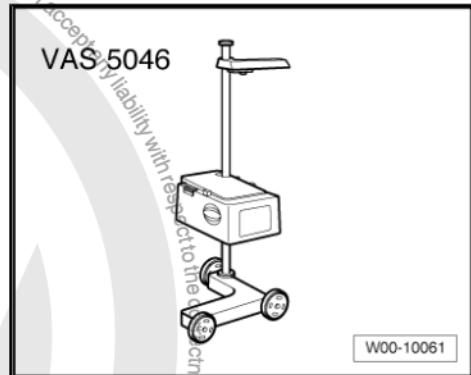




## 7 Headlights - check adjustment

Special tools and workshop equipment required

- ◆ Headlight aligner VAS 5046- or Headlight adjustment device -VAS 5047-



In principle, the following checking and adjustment description is valid for every country. However, it is necessary to consider the guidelines and standards of each country.

Checking and adjustment conditions:

- Tires inflation to correct OK.
- The headlight lenses must never be damaged or dirty.
- Reflectors and lamps OK.
- The vehicle load must be known.

Load: Load of one person or 75 kg weight on the driver's seat of empty vehicles (empty weight):

The weight of an empty vehicle is the weight of the vehicle ready for operation and with a full fuel tank (at least 90%), including the weight of every component required to operation (for instance, spare wheel, tools, towing hook, fire extinguisher, etc).

If the fuel tank is not at least 90% full, then simulate the load as follows:

- Check the tank level on the fuel gauge. Establish the additional weight according to the table below and put this weight in the boot.

Filling quantities table

Filling level on the tank indicator	Additional weight in kg
1/4	30
1/2	20
3/4	10
full	0

Example:

When the fuel tank is half full, you must place an additional weight of 20 kg in the boot.



Note

As additional weight, it is preferable to use fuel containers filled with water (one fuel container with a 5-liter capacity corresponds to a weight of approximately 5 kg).



The vehicle should be moved for a couple of meters and damped several times both at the front and at the rear so that the shock absorbers are properly settled.

- ◆ The vehicle and the headlight adjustment device must be on the same level ⇒ Instruction manual from the headlight adjustment device .
- ◆ The vehicle and the headlight adjustment device must be on a flat surface.
- ◆ Tilting must be adjusted.

The housing above the headlight has the tilt values engraved in "%". The headlights must be adjusted according to the following data. The percentage is related to a projection distance of 10 meters. A 1.0% tilting value, for example, corresponds to 10 cm.

The button for adjusting the headlight reach must be in the basic position (-).

## 7.1 Check headlight adjustment (with the new inspection display without 15° adjustment line)

### 7.1.1 Main headlights

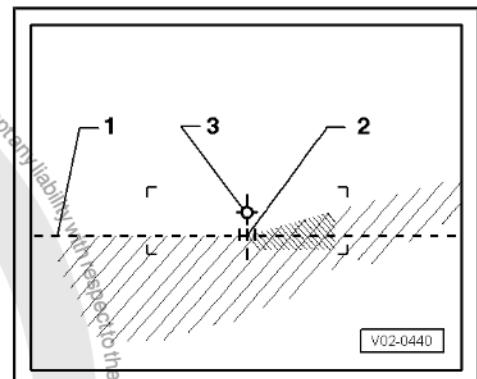
Please check the following:

- Check if, with low beam on, the horizontal light-dark limit contacts the separation limit -1- of the test surface.
- Check if the point of inflection -2- between the left horizontal part and the right ascending part of the light-dark limit runs vertically through the central mark -3-. In this case, the light core of the light beam is at the right of the vertical line.



#### Note

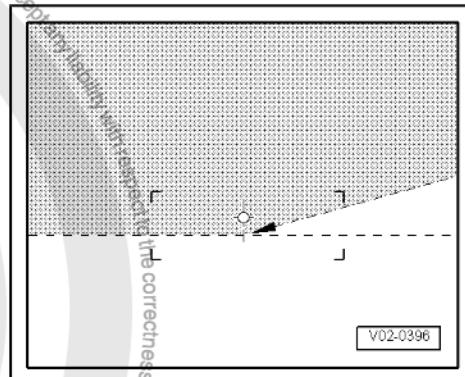
- ◆ Line -1- is the measure between the floor and the center of the headlight, subtracted of 120 mm for a distance of 10 m.
- ◆ Line -1- is the measure between the floor and the center of the headlight, subtracted of 60 mm for a distance of 5 m.
- ◆ For easier determination of the breaking point -2-, cover and then release the left half of the headlight (seen on the driver's side). Then, test the low beam once more.
- ◆ After correctly adjusting the low beam, the high beam is automatically adjusted, this means that the high beam center must be on the headlight central mark -3-. A 200-mm deviation to the right or to the left, 150 mm upwards and 100 mm downwards is acceptable.



V02-0440



- For the current checking viewer with an adjustment line of 15°, the same adjustment as for new checking viewer applies. To avoid incorrect adjustments, the 15° line will no longer be considered.



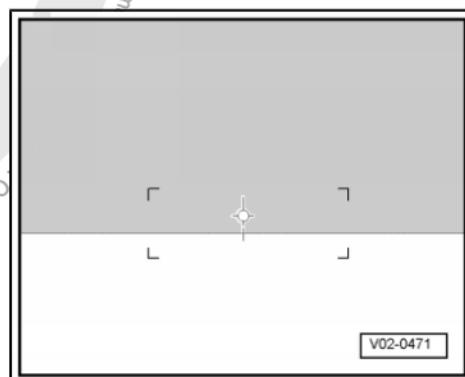
### 7.1.2 Fog lights

- Check if the light-dark limit reaches the adjustment line and runs vertically over the entire measuring device line.



#### Note

- ◆ The light-dark separation line is the measure between the floor and the center of the headlight, subtracted of 200 mm for a distance of 10 m.
- ◆ The light-dark separation line is the measure between the floor and the center of the headlight, subtracted of 100 mm for a distance of 5 m.



## 7.2 Headlights - adjust

### 7.2.1 Main headlights - adjust



#### Note

Adjustment of main headlights is identical on both sides; adjustment screws are symmetrically placed and the procedure below refers only to one of the headlights.

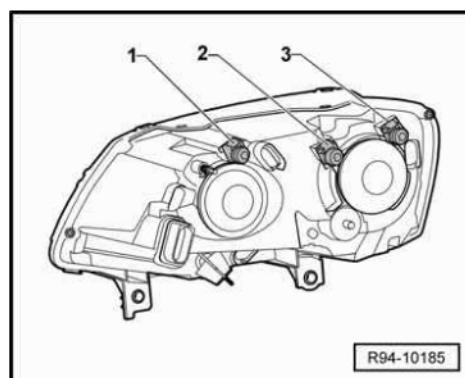
Twin headlight:

In order to adjust the height light/dark limit for the high beam headlight, turn the adjustment screw -1-.

In order to adjust the height light/dark limit for the low beam headlight, turn the adjustment screw -2-.

In order to adjust the side light/dark limit for the low beam headlight, turn the adjustment screw -3-.

Single headlight:

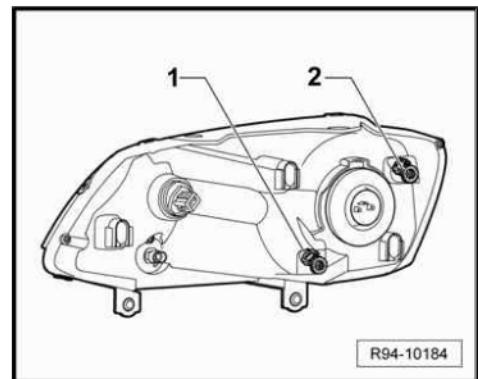




- In order to adjust the height light/dark limit for the main headlight, turn the adjustment screw -1-.
- In order to adjust the side light/dark limit for the main headlight, turn the adjustment screw -2-.



*Please check also if both headlights move symmetrically when positioning the light range.*

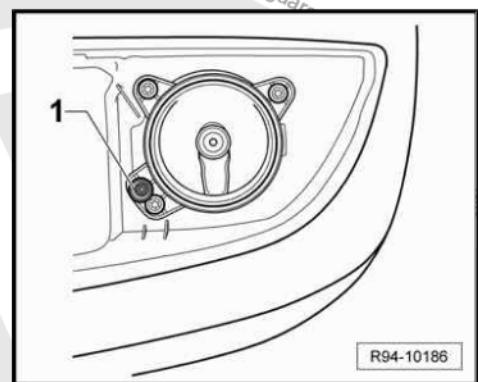


## 7.2.2 Fog lights - adjust



*Adjustment of fog lights is identical on both sides; adjustment screws are symmetrically placed and the procedure below refers only to one of the headlights.*

- In order to adjust fog light reach, turn the adjustment screw -1-.

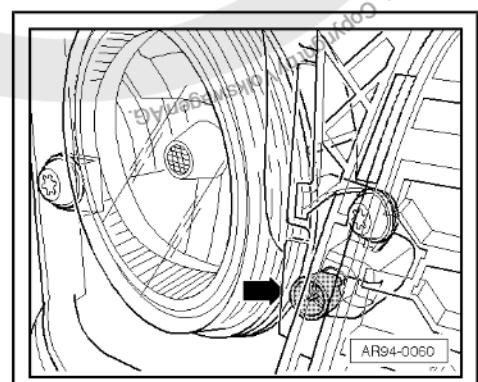


## 7.2.3 Fog lights (Suran Cross/Space Cross models) - adjust



*Adjustment of fog lights is identical on both sides; adjustment screws are symmetrically placed and the procedure below refers only to one of the headlights.*

- In order to adjust fog light reach, turn the adjustment screw -1-.

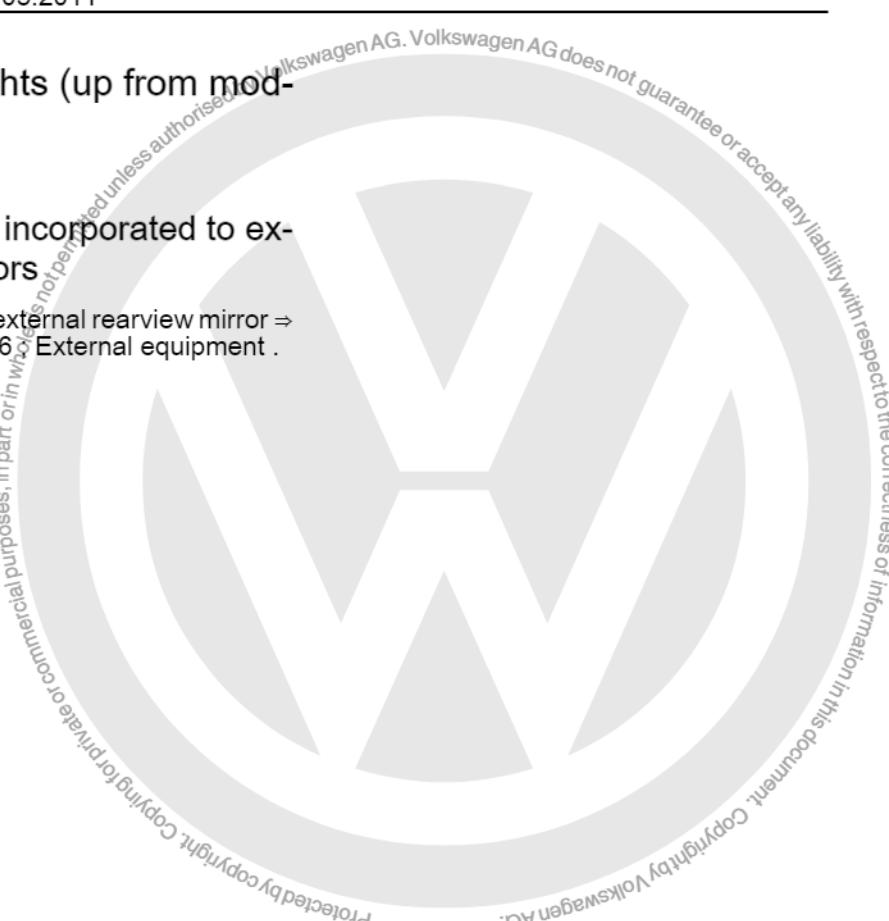




8 Side turn signal lights (up from model-year 2011)

8.1 Side indicator lights incorporated to external rearview mirrors

Remove side indicator incorporated to external rearview mirror ⇒  
Body - external mountings; Rep. Gr. 66 External equipment .





## 9 Tail lights (up to the model 2010)

### 9.1 Tail lights - assembly overview



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



#### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A-.*
- ◆ *Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).*
- ◆ *When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.*

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1 - Tail light

- Remove and install  
⇒ [page 140](#).

2 - Gasket

3 - Brake light and rear tail light lamp

- 12 V 21/5 W incandescent light bulb.

4 - Turn signal lamp

- 12 V 21 W incandescent light bulb.

5 - Tail light lamp

- 12 V 5 W incandescent light bulb.

6 - Lamp support

- In order to remove it, loosen the locks and pull the support.

7 - Fog light / back-up light

- 12 V 21 W incandescent light bulb.

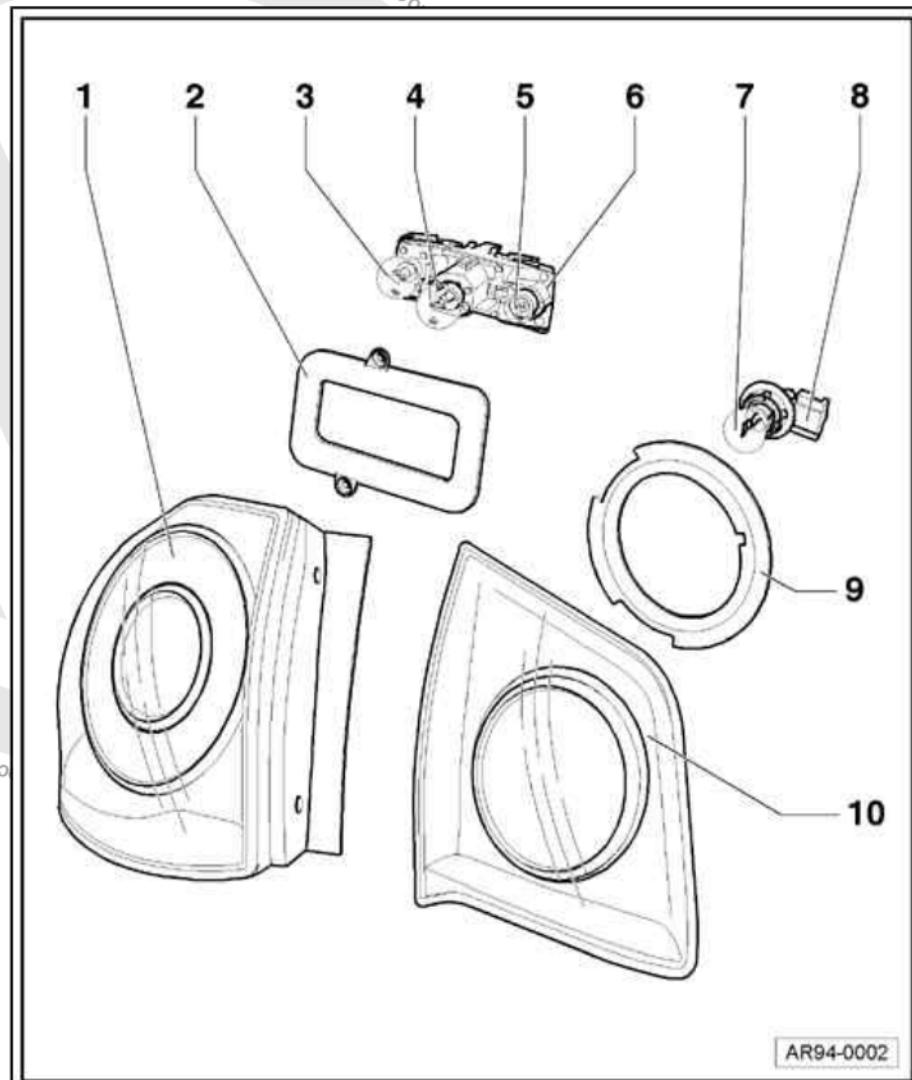
The rear fog light is only on the left side of the lamp support.

8 - Bulb holder

9 - Gasket

10 - Tail light on the engine compartment cover

- Remove and install  
⇒ [page 141](#).

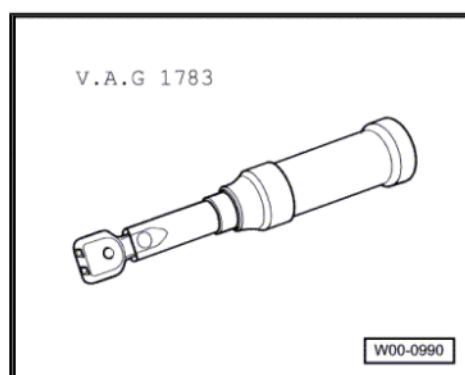


AR94-0002

## 9.2 Tail light - remove and install

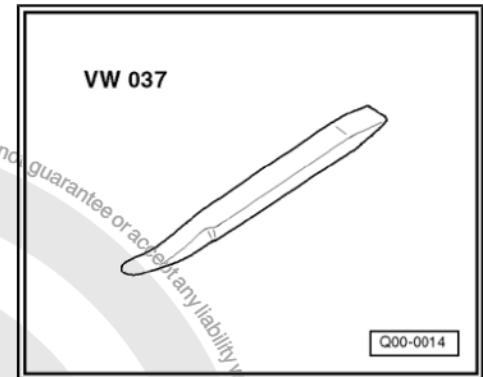
Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-





- ◆ Spatula -VW 037-

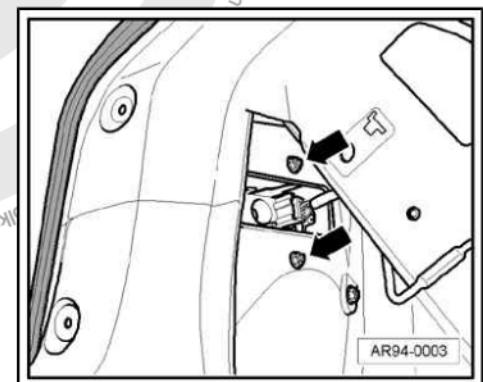


#### Note

*Removal and installation are described for the left side of the vehicle. Removal and installation on the right side of the vehicle are analogous.*

#### 9.2.1 Removal

- Remove the access cover to the tail lights on the side lining of the luggage compartment using the Spatula -VW 037- .
- Remove the lamp cover securing nuts -arrows-.
- Push the rear tail light in order to release the fit locks.
- Remove the tail light.
- Unlock and disconnect the connector.



#### 9.2.2 Installation

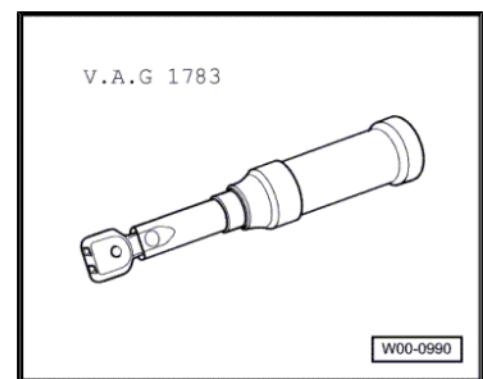
Installation is carried out in the reverse order of removal.

- Tighten the tail light fastening screw to the torque of 2-Nm.

#### 9.3 Tail light on the luggage compartment cover - remove and install

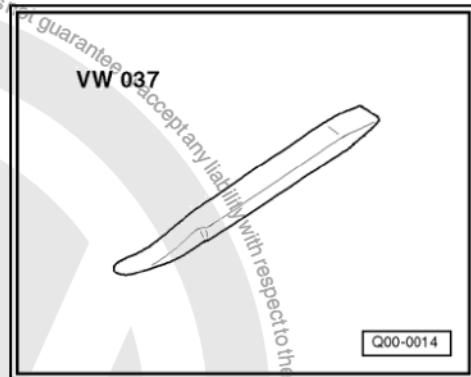
Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



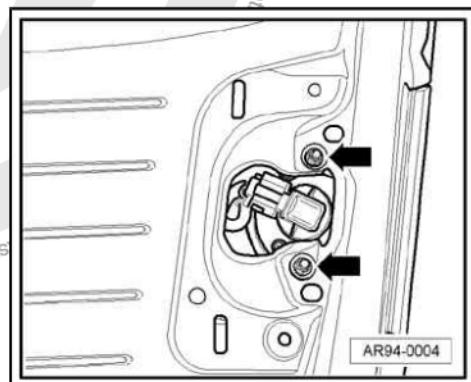


◆ Spatula -VW 037-



### 9.3.1 Removal

- Remove the cover from the trunk lid using the Spatula -VW 037- .
- Disconnect the connector.
- Unscrew the nuts -arrows- and remove the tail light.



### 9.3.2 Installation

Installation is carried out in the reverse order of removal.

- Tighten the tail light fastening screw to the torque of 1.5-Nm.



## 10 Tail lights (up to model-year 2011)

### 10.1 Tail lights - assembly overview



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



#### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A-.*
- ◆ *Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).*
- ◆ *When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.*





1 - Lamp support

- Disconnect the connector for removal, loosen the side locks and pull the bracket.

2 - Brake light and rear tail light lamp

- 12 V 21/5 W incandescent light bulb.

3 - Turn signal lamp

- 12 V 21 W incandescent light bulb.

4 - Back-up light lamp

- 12 V 21 W incandescent light bulb.

5 - Tail light

- Remove and install  
[⇒ page 144](#)

6 - Bulb holder

7 - Fog light bulb

- 12 V 21 W incandescent light bulb.

The rear fog light is only on the left side of the lamp support.

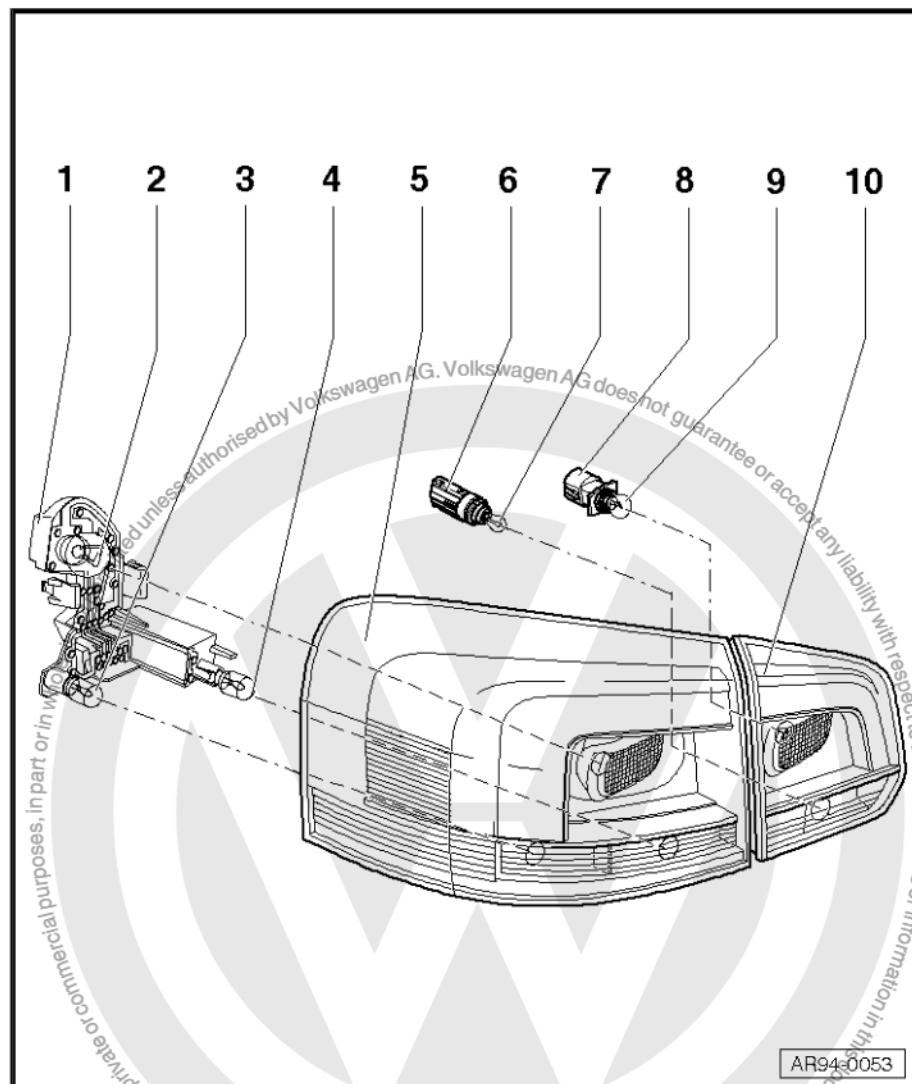
8 - Bulb holder

9 - Tail light lamp

- 12 V 5 W incandescent light bulb.

10 - Tail light on the engine compartment cover

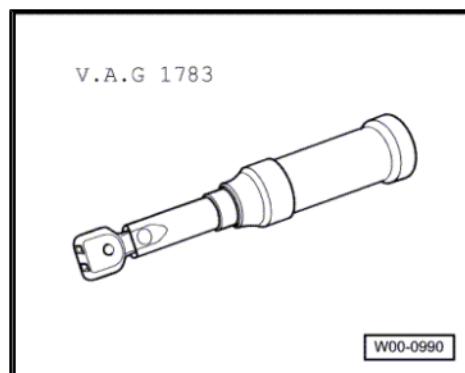
- Remove and install  
[⇒ page 146](#)



## 10.2 Tail light - remove and install

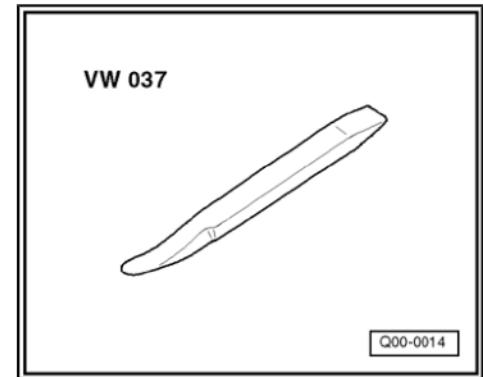
Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-





- ◆ Spatula -VW 037-

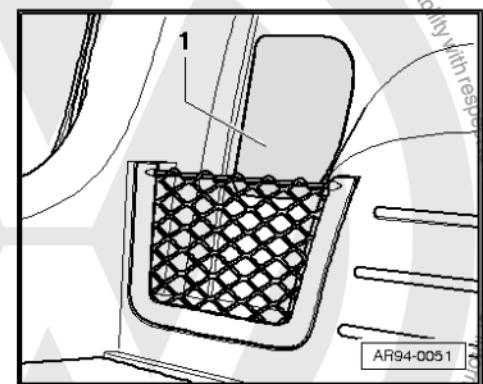


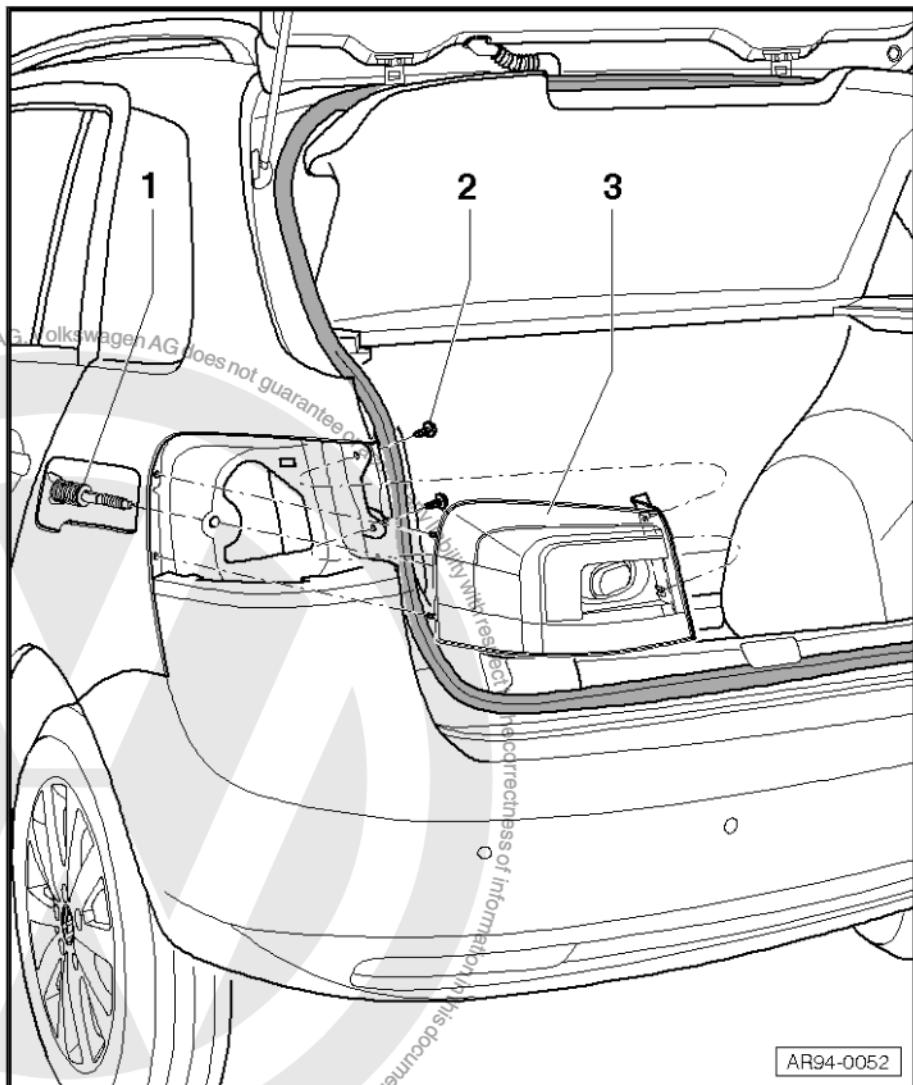
#### Note

*Removal and installation are described for the left side of the vehicle. Removal and installation on the right side of the vehicle are analogous.*

#### 10.2.1 Removal

- Remove the cover -1- that provides access to the tail lights on the side lining of the luggage compartment, using the Spatula -VW 037- .
- Remove the tail light side fastening screws -2-.
- Loosen the spring nut -1- and remove it.
- Remove the tail light -3-.





- Unlock and disconnect the connector from the wiring harness.

### 10.2.2 Installation

Installation is carried out in the reverse order of removal.

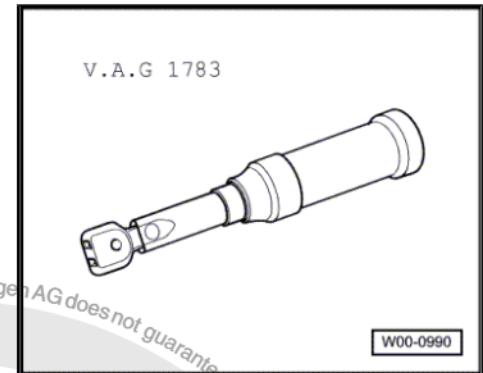
- Tighten the tail light fastening screw to the torque of 2.0-Nm.

### 10.3 Tail light on the luggage compartment cover - remove and install

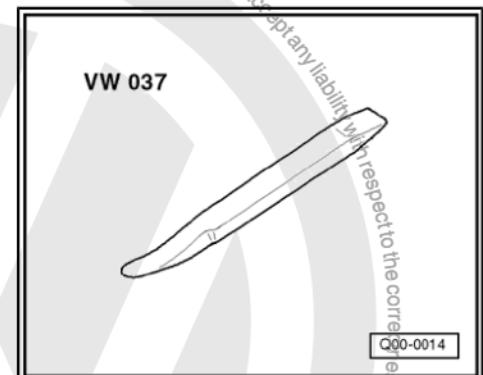
Special tools and workshop equipment required



- ◆ Torque wrench 2 to 10 Nm -VAG 1783-

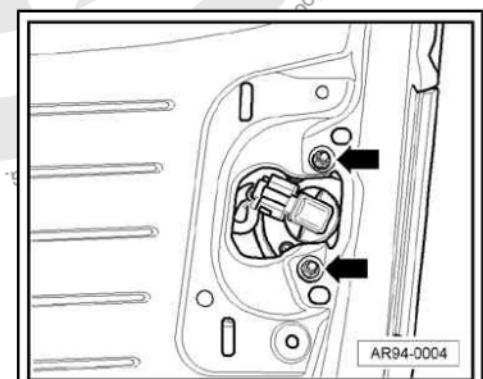


- ◆ Spatula -VW 037-



### 10.3.1 Removal

- Remove the cover from the trunk lid using the Spatula -VW 037- .
- Disconnect the connector.
- Unscrew the nuts -arrows- and remove the tail light.



### 10.3.2 Installation

Installation is carried out in the reverse order of removal.

- Tighten the tail light fastening screw to the torque of 1.5-Nm.



## 11 License plate light

### 11.1 License plate light - remove and install



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

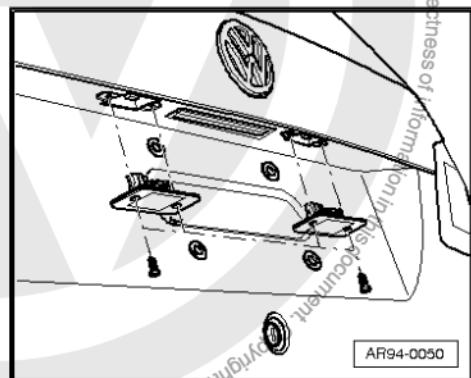


#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### 11.1.1 Removal

- Remove the license plate light, loosing the screws.
- Remove the lamp socket.



#### 11.1.2 Installation

Install by inverting the removal sequence, paying attention to the following:

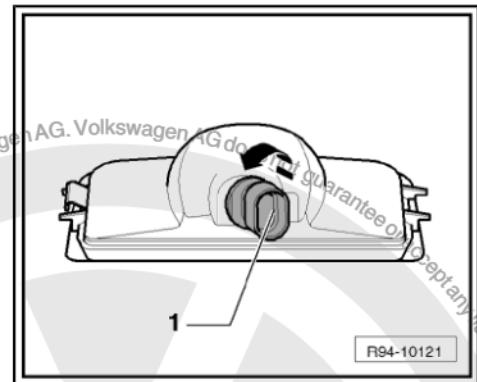
- After installing, check the license plate light functioning.



## 11.2 License plate light -X- - change the lamp

### 11.2.1 Removal

- Release the socket -1- by turning it towards -arrow-.
- Remove the lamp from the corresponding housing.



### 11.2.2 Installation

Installation is carried out in the reverse order of removal.

- After installing, check the license plate light functioning.



## 12 Auxiliary brake light



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

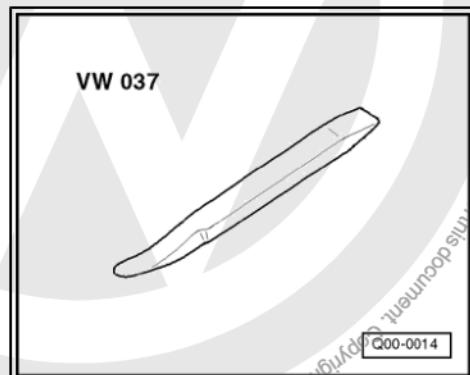


### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

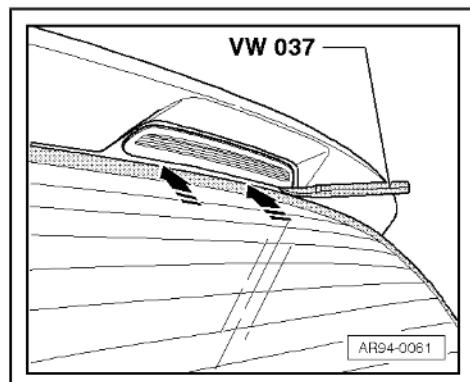
- ◆ Spatula -VW 037-



### 12.1 Auxiliary brake light - remove and install

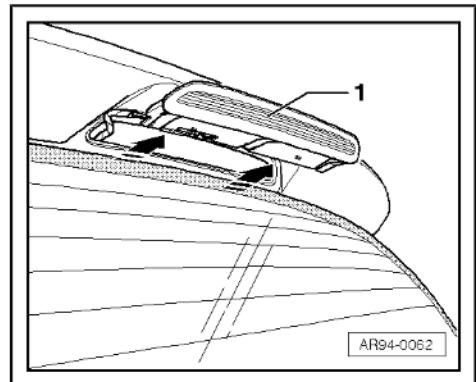
Removal:

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .
- Carefully using a Spatula -VW 037- , unlock the locks in the lower portion of the auxiliary brake light.





- Remove auxiliary brake light -1- carefully using a Spatula -VW 037- , unlocking the locks by

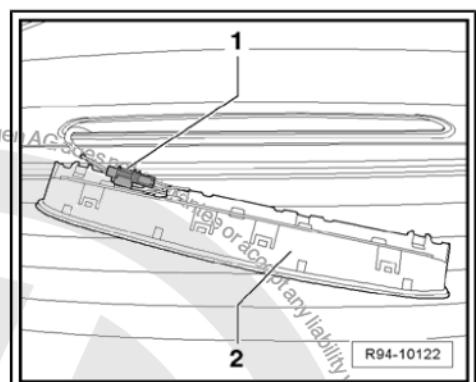


- Disengage the connector -1- , and remove the auxiliary brake light-2-.

#### Installation:

Install by inverting the removal sequence, paying attention to the following:

- After installation, check the operation of the auxiliary brake light.





## 13 Switch set



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

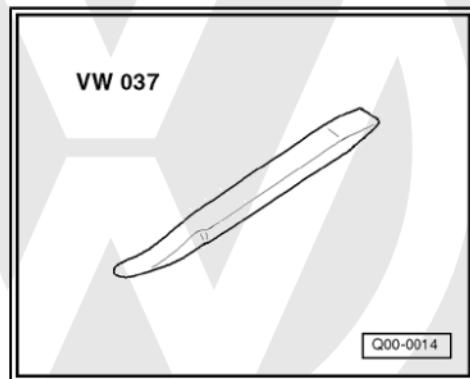
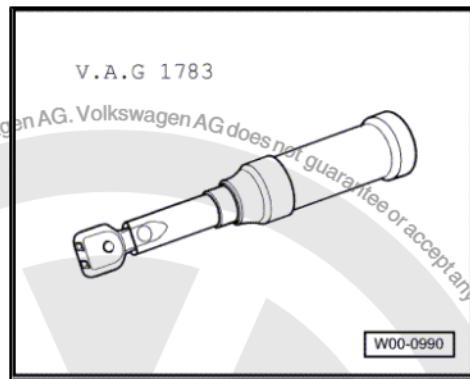


### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



- ◆ Spatula -VW 037-



**13.1 Light switch -E1- / Flashing/turn light switch -E2- and Windshield wiper timer switch (intermittent operation) -E22- - remove and install**

**13.1.1 Removal**

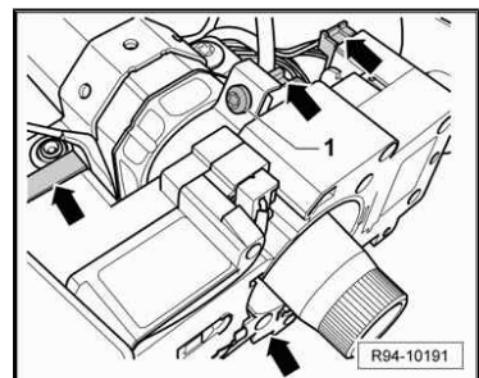
- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#).
- Place the steering wheel in the central position (straight wheels).
- Pull off steering wheel ⇒ Running gear, ??axles, ??steering; Rep. Gr. 48 ; Steering .
- Remove the steering column covering ⇒ Body - internal mountings; Rep. Gr. 70 ; Lining / Insulation .

Vehicles with Airbag:

- Remove contact ring ⇒ Body - internal mountings; Rep. Gr. 69 ; Occupants' protection .

Continuation for all vehicles:

- Remove fixing screws-1 - from the switchbox cables.
- Pull off connectors -arrows- from the switchbox cables.
- Remove the switch set.



**13.1.2 Installation**

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screw to a torque of 3 Nm.

**13.2 Occupation of switches in the switch set for indicator lights and window wiper/washer**

The pin occupation of the switch set connectors for indicator light and window wiper/washer is described in the electrical diagrams ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



## 14 Steering lock set



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

### 14.1 Steering lock set - remove and install

#### 14.1.1 Removal

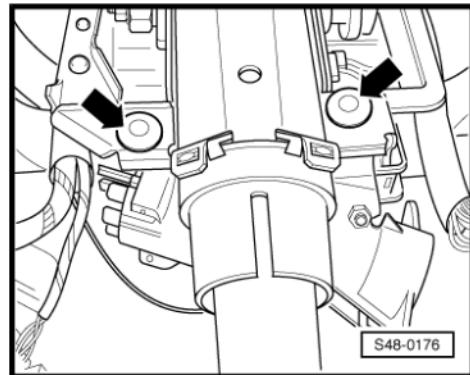
- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove the turn signal light and wiper/washer switches [⇒ page 153](#) .
- Remove the key cylinder [⇒ page 156](#) .
- Remove the ignition and start switch [⇒ page 158](#) .
- Remove the rupture screws -arrows- using a drill with a suitable drill bit or, if necessary, a chisel.



### WARNING

*Wear protective goggles.*

- Remove the steering lock set.



#### 14.1.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Position the steering lock set.

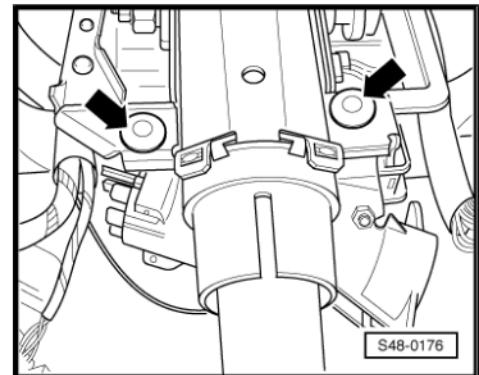


### Note

*Check positioning of the steering lock set in the steering column.*



- Carefully tighten the rupture screws until their heads -arrows- are separated.
- Install the indicator and wiper/washer switches [⇒ page 153](#) .
- Install the key cylinder [⇒ page 156](#) .
- Install the ignition and starter switch [⇒ page 158](#) .





## 15 Ignition/start switch and key cylinder



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*



### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

### 15.1 Key cylinder - remove and install

#### 15.1.1 Removal

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .
- Place the steering wheel on the central position (straight wheels).
- Pull off steering wheel ⇒ Running gear, ??axles, ??steering; Rep. Gr. 48 ; Steering .
- Remove upper and lower steering column coverings ⇒ Body - internal mountings; Rep. Gr. 70 ; Lining / Insulation .
- Carefully disconnect the connector -arrow- from the Immobilizer reading coil -D2- in the key cylinder.



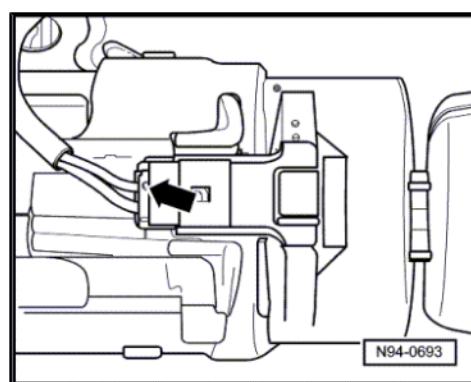
### Note

*A Immobilizer reading coil -D2- is fastened in the key cylinder and cannot be replaced individually.*

- Insert the ignition key in the key cylinder and turn to the position "on".

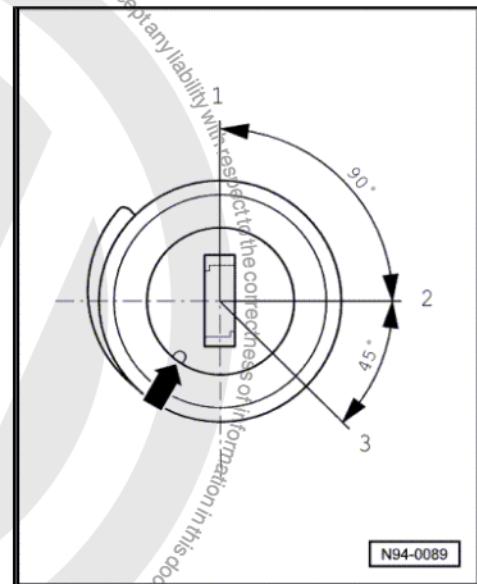
Key positions in the key cylinder:

- 1 - Position "turned off"
- 2 - Position "on"
- 3 - Position "start"



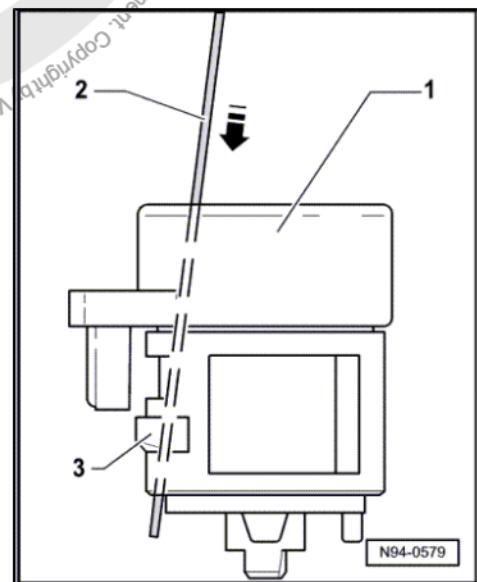


- Insert a steel wire (of approx. Ø 1.2 mm) in the hole beside the key cylinder -arrow-.



- Unblock the safety lever from the key cylinder with the steel wire -arrow- and extract the key cylinder from the steering lock set.

1 - Key cylinder  
 2 - Steel wire (approx. Ø 1.2 mm)  
 3 - Safety lever



### 15.1.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Insert the ignition key in the key cylinder and turn to the position "on".
- Unblock the retaining lever with a wire (approx. Ø 1.2 mm) and place the key cylinder in the steering lock assembly.



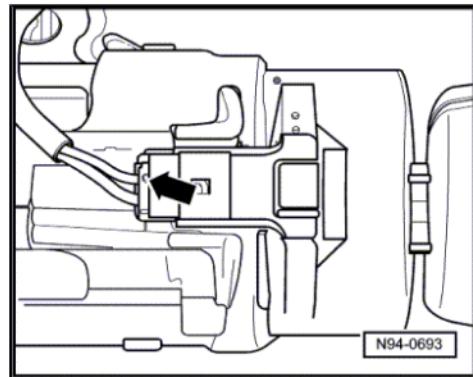
#### Note

When positioning the key cylinder, make sure that the Immobilizer reading coil -D2- connection is in the steering lock set guide.

- Remove the wire from the key cylinder and check the cylinder for correct seating in the steering lock set.



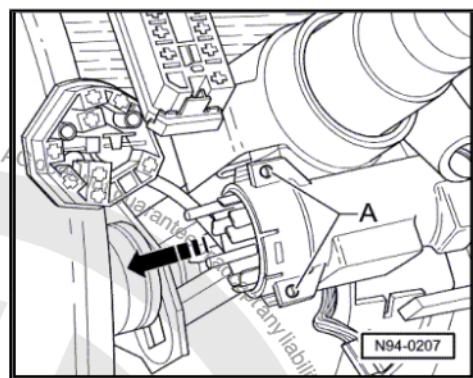
- Engage the connector -arrow- from the Immobilizer reading coil -D2- in the key cylinder.



## 15.2 Ignition switch -D- - remove and install

### 15.2.1 Removal

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove the turn signal light and wiper/washer switches [⇒ page 153](#) .
- Disconnect the multiple connector from the Ignition switch -D- .
- Remove the sealing paint from the fastening screws -A-.
- Loosen the fastening screws -A- and extract the Ignition switch -D- in the direction of -arrow- from the steering lock assembly.



### 15.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Insert the Ignition switch -D- on the steering lock assembly.



*While installing, make sure the Ignition switch -D- and the key cylinder are at the same position, for example, "ignition on".*

- Tighten the fastening screws and seal with the sealing paint.
- Connect the multiple connector to the Ignition switch -D- .
- Install the indicator and wiper/washer switch sets [⇒ page 153](#) .

## 15.3 Ignition switch -D- - occupation of pins

The pinout of the Ignition switch -D- is described in the electrical diagrams ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



## 16 Tightening torque

Location	Tightening torque
Headlights	3.5 Nm
Fog lights	2 Nm
Long range headlights	1 Nm
Tail light	2 Nm
Auxiliary brake light	1.5 Nm



## 96 – Switches, lights and internal bulbs, alarm

### 1 Lights and internal switches



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the battery earth strap of [page 34](#).*



#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap.
- ◆ When the battery is reconnected, check the operation of the vehicle electrical system (radio, clock and electric door and window locks, etc.) according to the Workshop Manual and/or instructions for use.

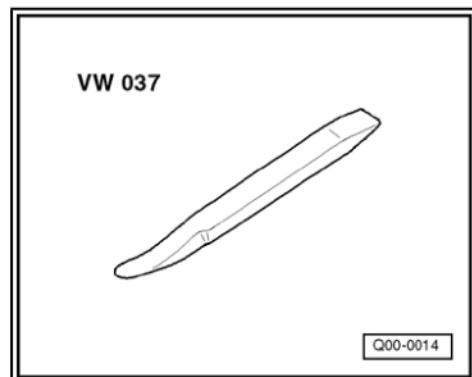
#### 1.1 Light switch - remove and install

- The light switch is an integral part of the of the switch assembly. Remove and install [page 153](#)

#### 1.2 Instrument panel switches (up to model-year 2010) - remove and install

Special tools and workshop equipment required

- ◆ Spatula -VW 037-



#### 1.2.1 Removal



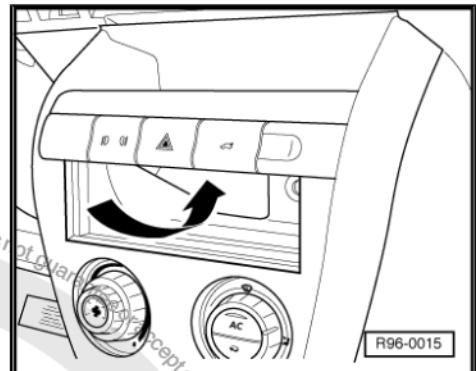
#### Note

*The switches shall be removed from the instrument panel with the connected cables in order to allow disconnecting their corresponding connectors.*

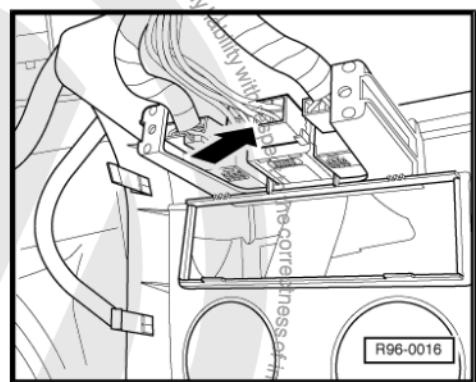
- Remove the radio ⇒ Communication; Rep. Gr. 91 ; Radio equipment .



- Insert your hand through the radio opening -arrow-.



- Press the switches from the panel inside outwards.
- Pull off connectors -arrow- and remove the switches.



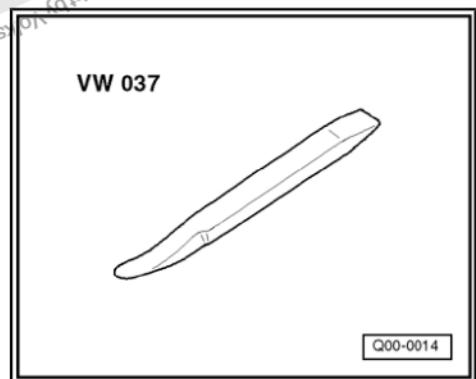
## 1.2.2 Installation

Installation is carried out in the reverse order of removal.

## 1.3 Instrument panel switches (up from model-year 2011) - remove and install

Special tools and workshop equipment required

- ◆ Spatula -VW 037-





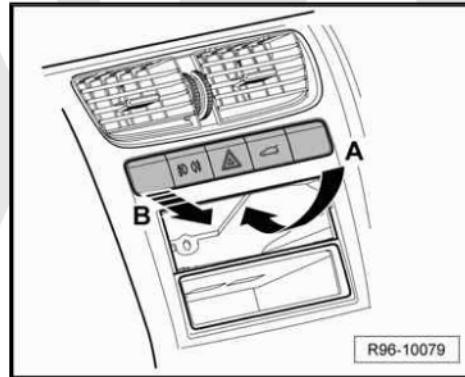
### 1.3.1 Removal



#### Note

- ◆ The switches must be removed from the instrument panel with its connectors on.
- ◆ To enable pulling the switch cable in a sufficient way, you may be occasionally required to remove the switch beside it.
- ◆ Covers, which are installed accordingly to each type of vehicle, may be carefully levered from outside with a Spatula -VW 037- .
- ◆ These covers may be removed and installed in a similar way as for the switches.

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .
- Remove the radio ⇒ Communication; Rep. Gr. 91 ; Radio, telephone, navigation system .
- Insert your hand through the panel opening -arrow A-.
- Press the switches from inside the panel out -arrow B-.
- Pull off connectors -arrow- and remove the switches.



### 1.3.2 Installation

Installation is carried out in the reverse order of removal.

## 1.4 Front internal light -W1- with reading light

The Front internal light -W1- comprises the following components:

- ◆ Driver side reading light -W19- .
- ◆ Passenger side reading light -W13- .
- ◆ Ultrasound sensor for the alarm system -G209- .



#### Note

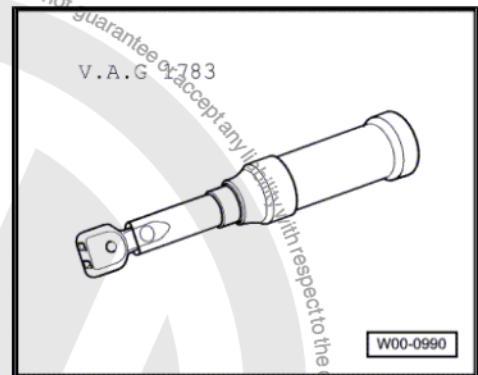
To replace the Front internal light -W1- , remove the diffuser lens only.

### 1.4.1 Front internal light -W1- with reading light - remove and install

Special tools and workshop equipment required

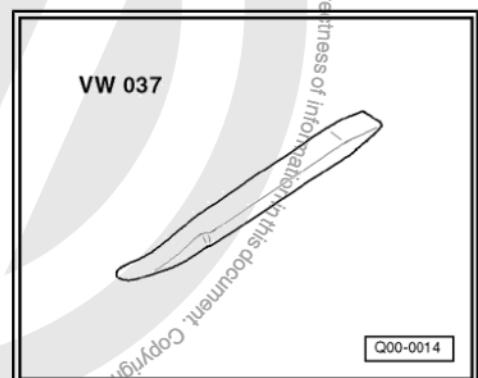


◆ Torque wrench 2 to 10 Nm -VAG 1783-



W00-0990

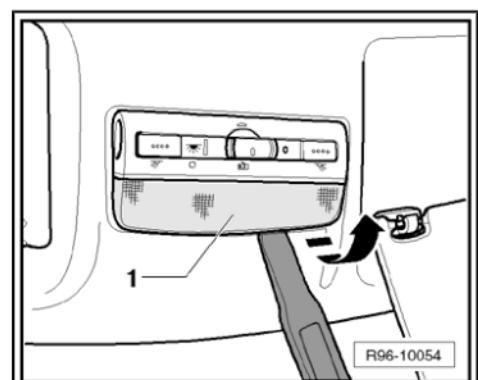
◆ Spatula -VW 037-



Q00-0014

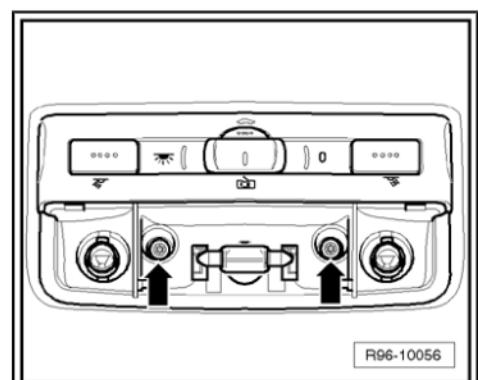
**Removal:**

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove light lens -1- in the direction of the -arrow-with the Spatula -VW 037- .



R96-10054

- Loosen and remove fastening screws -arrows- from the internal lighting fixture.



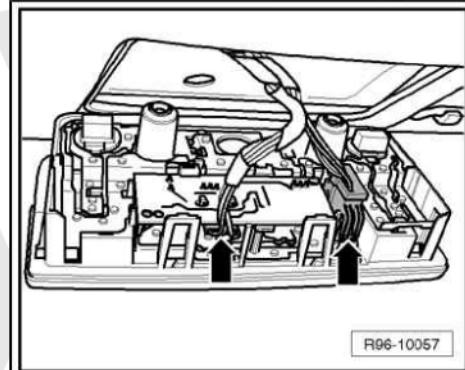
R96-10056



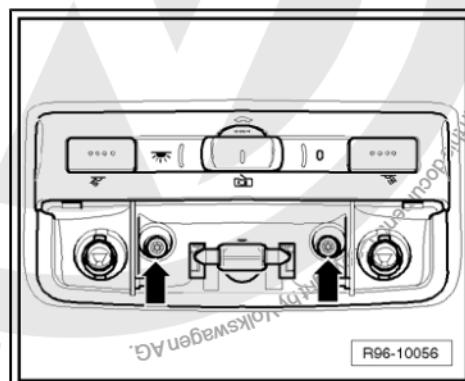
- Pull off connectors -arrows- and remove the internal lighting fixture from the roof lining.

Installation:

Install by inverting the removal sequence, paying attention to the following:



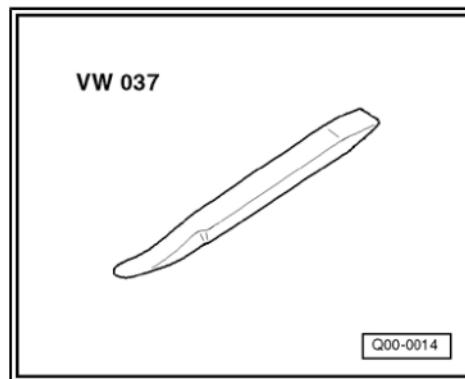
- Tighten the fastening screws -arrows- with a torque of 1.5 Nm.



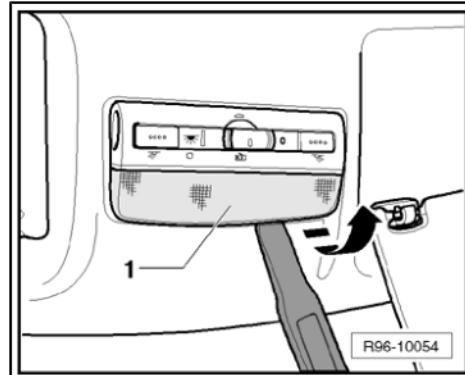
#### 1.4.2 Front internal light -W1- with reading light - replace lamp

Special tools and workshop equipment required

- ◆ Spatula -VW 037-

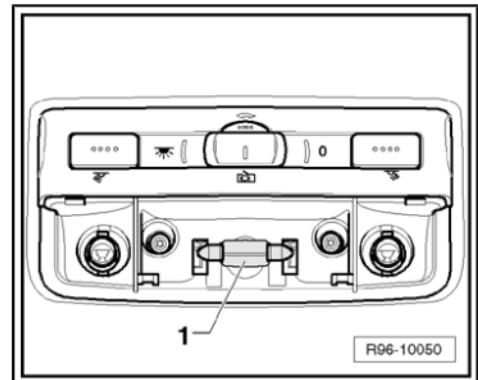


- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove light lens -1- in the direction of the -arrow-with the Spatula -VW 037- .



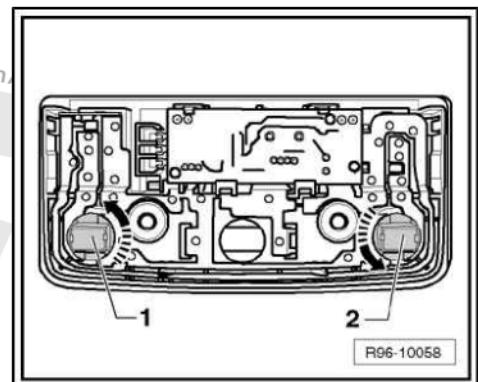


- Replace the lamp -1- (C5W - 12V, 10W).
- Install a new light and check that it works properly.

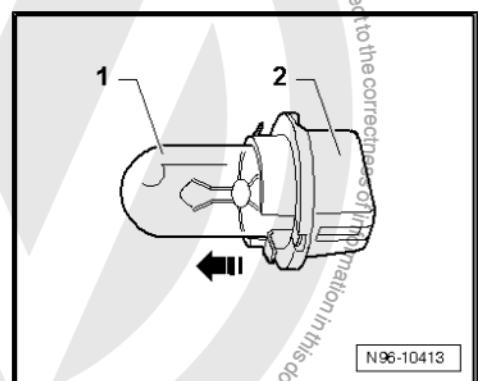


#### 1.4.3 Left center reading light -W39- and/or Right center reading light -W40- with reading light - replace lamp

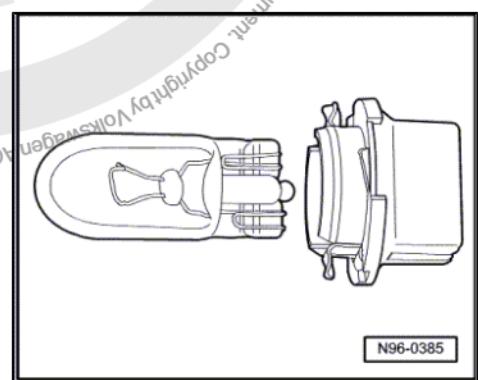
- Remove the internal lighting [⇒ page 162](#).
- Turn the socket -1- and/or -2- with the Left center reading light -W39- and/or Right center reading light -W40- in the direction of the -arrows-.



- Remove lamp-1- (W5W - 12V, 5W) in direction of -arrow- from the respective socket -2-.



- Replace the lamp (W5W - 12 V, 5 W).





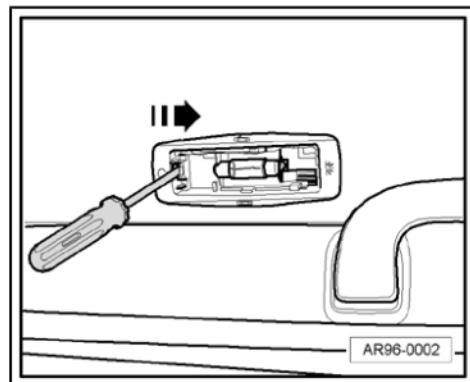
## 1.5 Rear interior light -W43- - remove and install



*To replace the light bulbs from Rear internal light -W43- , which is only necessary to remove the inside light lens.*

### 1.5.1 Removal

- Remove the diffuse lens from Rear internal light -W43- .
- Release the lock towards the arrow with help of a screwdriver.
- Remove the interior light by moving it towards the vehicle front.
- Disconnect the connector.



### 1.5.2 Installation

Installation is carried out in the reverse order of removal.

## 1.6 Vanity mirror lighting - removal and installation

### 1.6.1 Removal



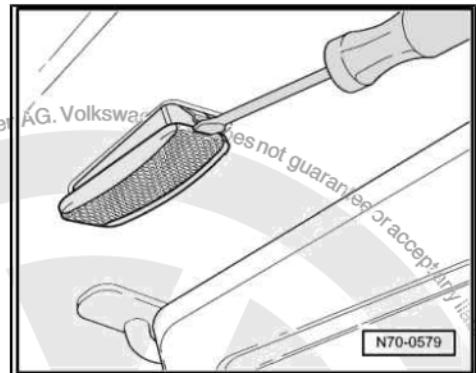
◆ *When removing and installing the visible components (switches, covers, linings, etc.), protect the areas where lever tools were used.*

◆ *Dismounting and mounting both lamps is identical; the description refers to only one side.*

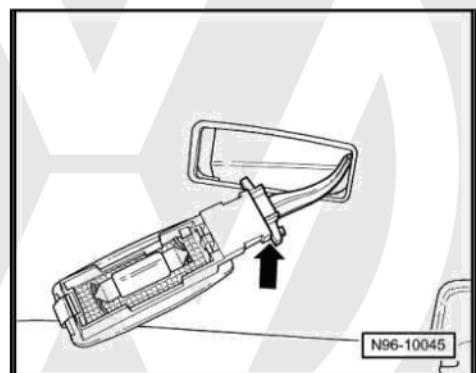
- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .



- Raise the lighting fixture carefully with a Wedge -3409- or a screwdriver and remove it from the roof lining.



- Pull off connector -arrow-.
- Remove the lighting fixture from the vanity mirror.

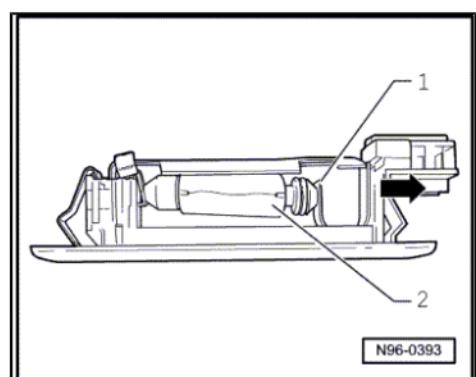


## 1.6.2 Installation

Installation is carried out in the reverse order of removal.

## 1.6.3 Vanity mirror lighting lamp -L31- re-place

- Remove the lighting fixture from the vanity mirror  
⇒ page 166 .
- Move the contact blade -1- in the direction of -arrow- and remove the Vanity mirror lighting lamp -L31- -2- from the housing.
- Replace the Vanity mirror lighting lamp -L31- -2- (12V - 5W).



## 1.7 Glove compartment light -W6-

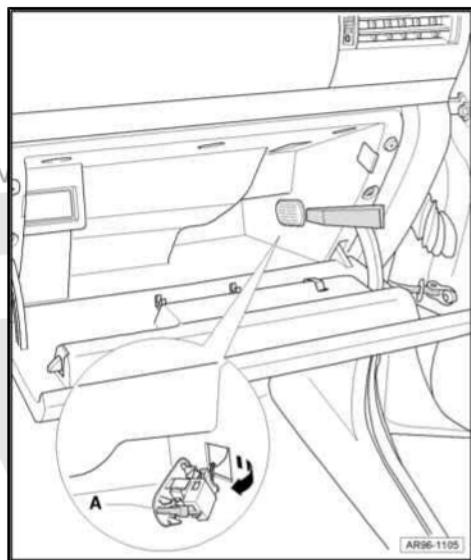


*To replace the light bulbs from Glove compartment light -W6-, simply remove it from its mounting after removing Glove compartment light -W6- .*



### 1.7.1 Removal

- Remove Glove compartment light -W6- using a plastic wedge.
- Move Glove compartment light -W6- removing it from its housing being careful with activation switch -A-.
- Disconnect the connector and remove Glove compartment light -W6- .



### 1.7.2 Installation

Installation is carried out in the reverse order of removal.



## 2 Front door lights and switches



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

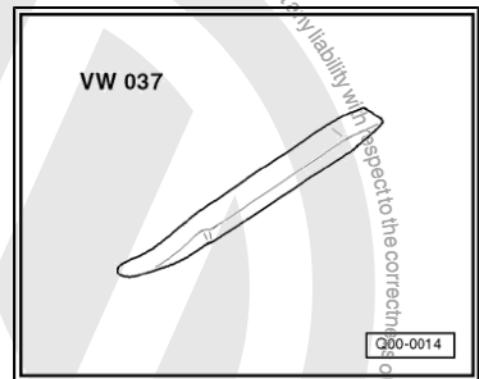


### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

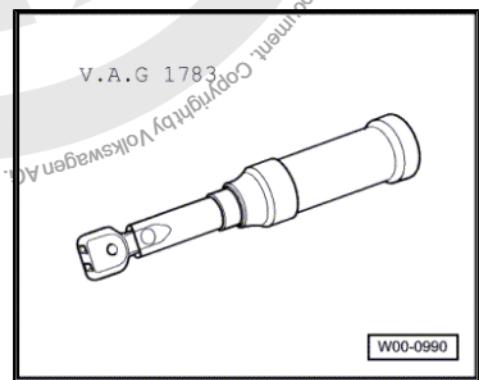
- ◆ Spatula -VW 037- .



### 2.1 Front interior light switch. (door contact) -E459- - remove and install

#### Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-

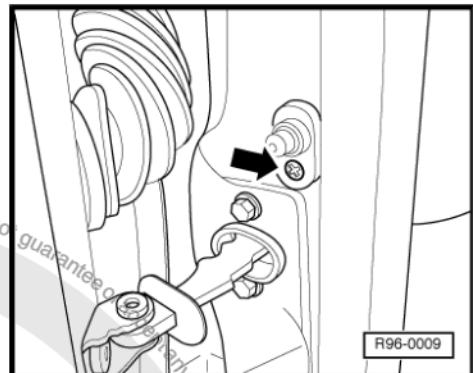


#### 2.1.1 Removal

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .



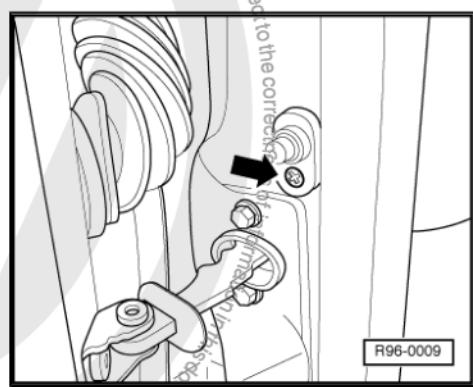
- Remove fixing screws -arrow- on pillar A and remove the switch.



## 2.1.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screw -arrow- to the torque of 1 + 0.1 Nm.



## 2.2 Front/rear window drive switches and window block switch - remove and install



### Note

- ◆ *Switch frame is not removable; pictures show them separated for better visualization.*
- ◆ *Switch removal and installation is similar for both sides and only driver's door is depicted herein.*

Removal:

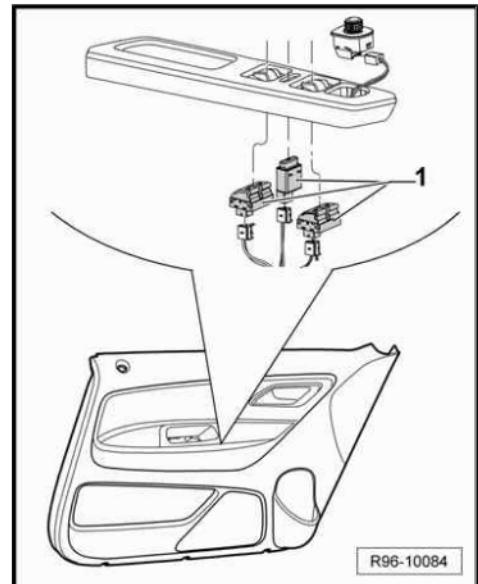
- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#).
- Remove the driver door lining ⇒ Body - internal mountings; Rep. Gr. 70 ; Lining / Insulation .



- Disengage switches -1- by releasing its side locks with a Spatula -VW 037- .

Installation:

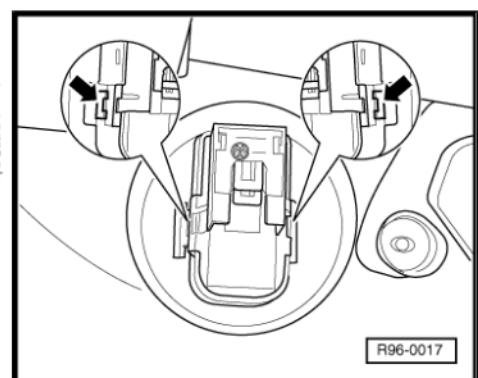
Installation is carried out in the reverse order of removal.



## 2.3 Rearview mirror adjustment switch - E43- with Mirror adjustment changeover switch-E48- (up to model-year 2010) - remove and install

### 2.3.1 Removal

- Remove the driver door lining ⇒ Body - internal mountings Rep. Gr. 70 ; Door lining - remove and install .
- Disconnect switch connector.
- Unclip the switch by pressing their locks -arrows- and remove it.



### 2.3.2 Installation

Installation is carried out in the reverse order of removal.

## 2.4 Rearview mirror adjustment switch - E43- with rearview mirror adjustment switch -E48- (up from model-year 2011) - remove and install



Note

*Switch frame is not removable; pictures show them separated for better visualization.*

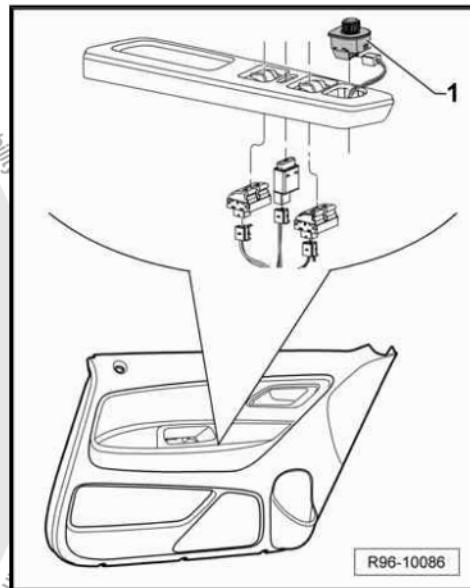


Removal:

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .
- Remove the driver door lining → Body - internal mountings; Rep. Gr. 70 ; Lining / Insulation .
- Disengage the Rearview mirror adjustment switch -E43- with rearview mirror adjustment switch -E48- -1- by releasing its side locks with a Spatula -VW 037- .
- Disconnect the connector.
- Remove the Rearview mirror adjustment switch -E43- with rearview mirror adjustment switch -E48- -1-.

Installation:

Install in removal reversed order.



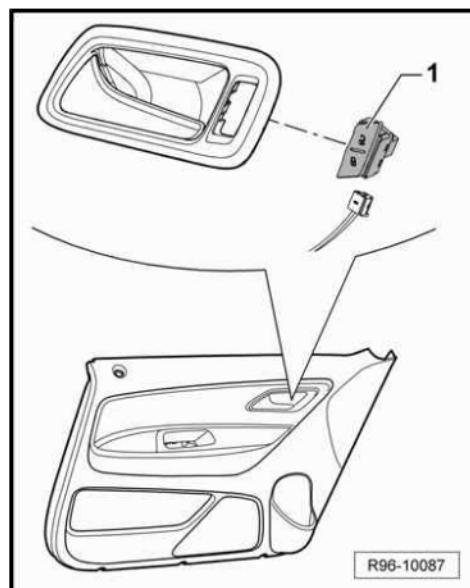
## 2.5 Interior locking switch, driver side - E150- - remove and install

Removal:

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [page 34](#) .
- Carefully remove handle frame using a Spatula -VW 037- .
- Disengage the Interior locking switch, driver side -E150- -1- by releasing its side locks with a Spatula -VW 037- .
- Disconnect switch connector.

Installation:

Install in removal reversed order.





### 3 Lights and switches in the boot



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

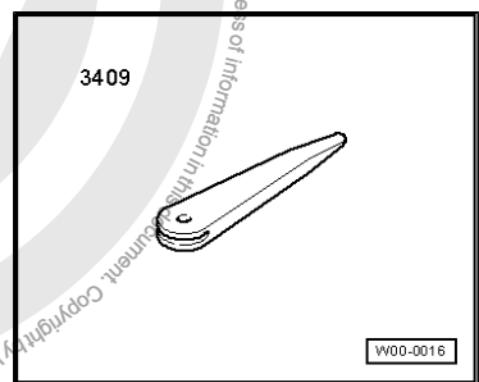


#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

- ◆ Wedge -3409-



### 3.1 Trunk lighting switch -F5- - remove and install



#### Note

*The switch is located in the trunk lock and is only replaced along with the lock.*

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove and install the trunk lock ⇒ Body - external mountings; Rep. Gr. 55 ; Covers .

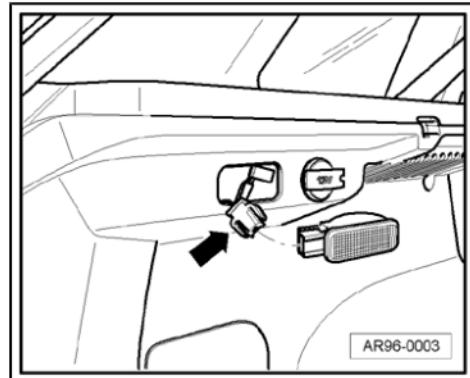
### 3.2 Trunk lighting -W3- - remove and install

#### 3.2.1 Removal

- Carefully disengage the diffuse lens using a screwdriver and remove Trunk lighting -W3- .



- Pull off connector -arrow-.

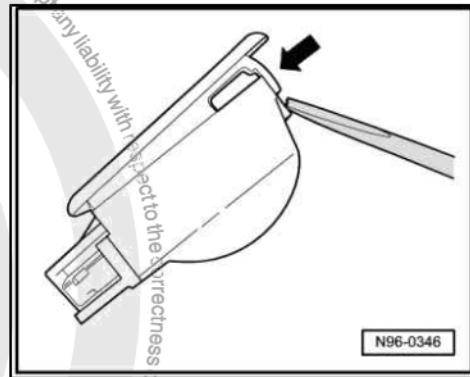


### 3.2.2 Installation

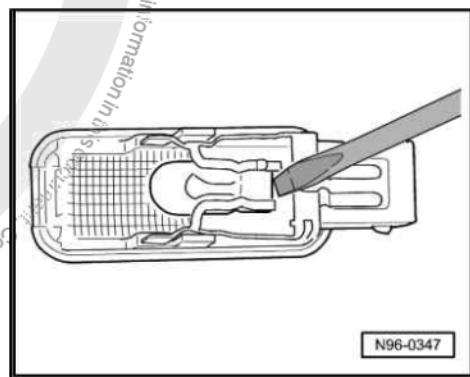
Installation is carried out in the reverse order of removal.

### 3.2.3 Trunk lighting -W3- change the lamp

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Remove trunk lighting [⇒ page 173](#).
- Release the lock -arrow -with a screwdriver and remove the cover on the Trunk lighting -W3- .



- Remove the Trunk lighting -W3- with a screwdriver and remove the lamp -2-.
- Replace the lamp in the Trunk lighting -W3- (12V - 5W).



### 3.3 12 V socket in the luggage compartment

#### 3.3.1 Removal

- Remove the side lining from luggage compartment ⇒ Body - internal mountings; Rep. Gr. 70 ; Luggage compartment side lining - remove and install .
- Disconnect the socket connector.
- Remove the socket by pulling it outside the liner.



### 3.3.2 Installation

Installation is carried out in the reverse order of removal.

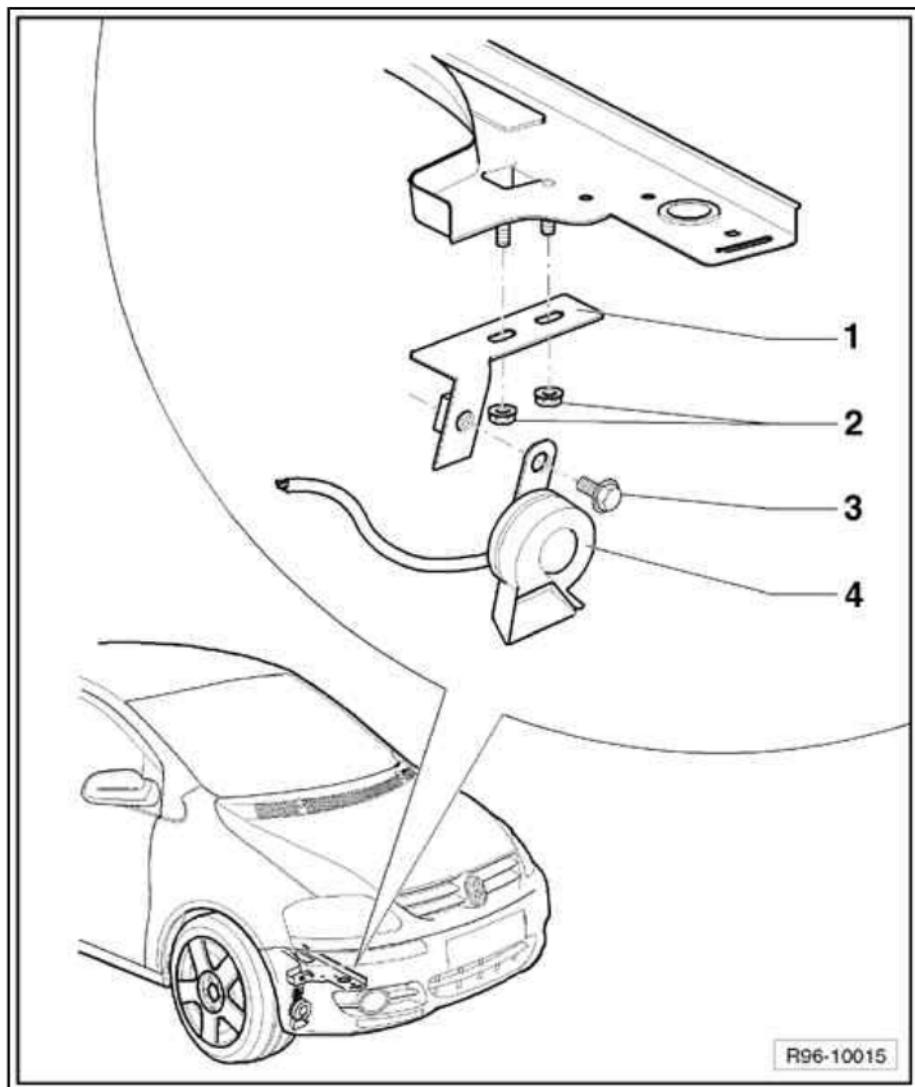




## 4 Horns

### 4.1 Horn - assembly overview

- 1 - Nuts
- 2 - Fastening support
- 3 - Screw
- 4 - Horn



### 4.2 Horn - remove and install

#### 4.2.1 Removal

- In order to remove the horn and its support, remove the securing nuts.
- Disconnect the connector.

#### 4.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
[⇒ page 195](#).



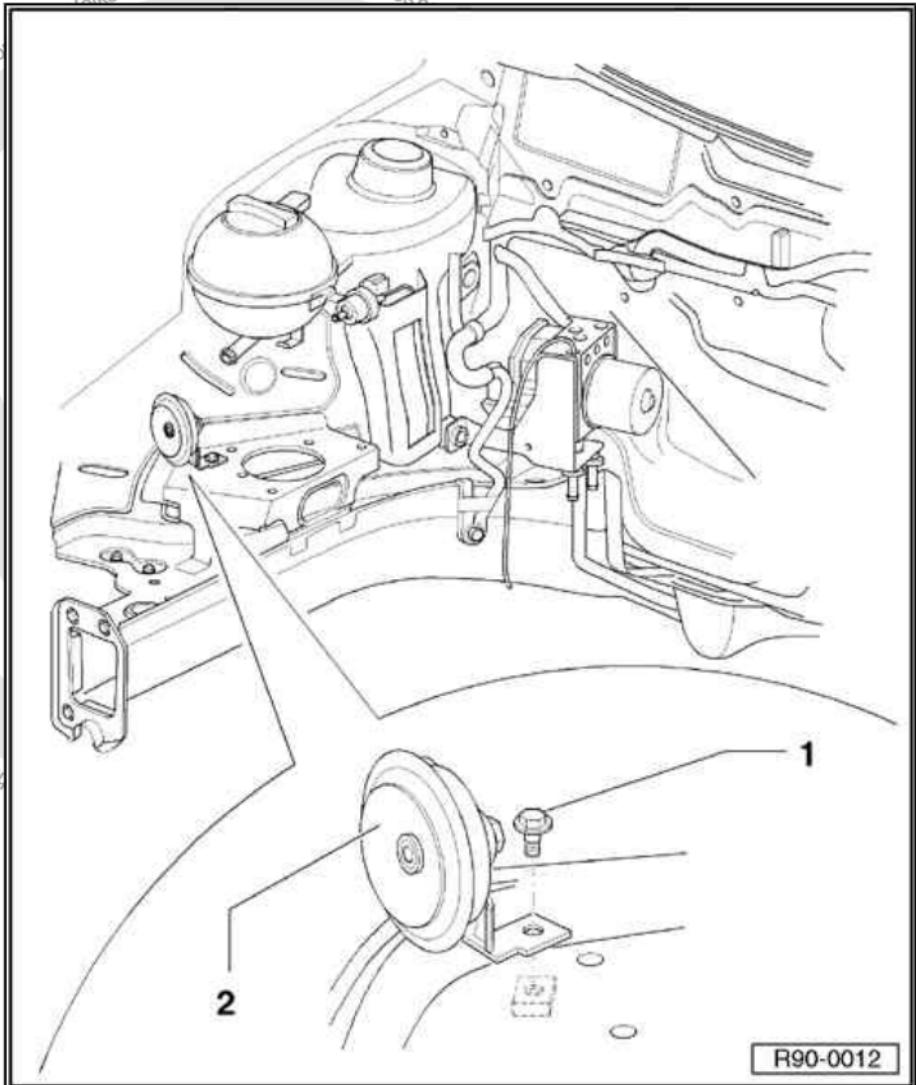
## 4.3 Alarm horn - remove and install

### 4.3.1 Removal

1 - Alarm horn support fixing screws

2 - Alarm horn

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- In order to remove the alarm horn with its support, remove the fixing screw -1-.
- Disconnect the connector.

### 4.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

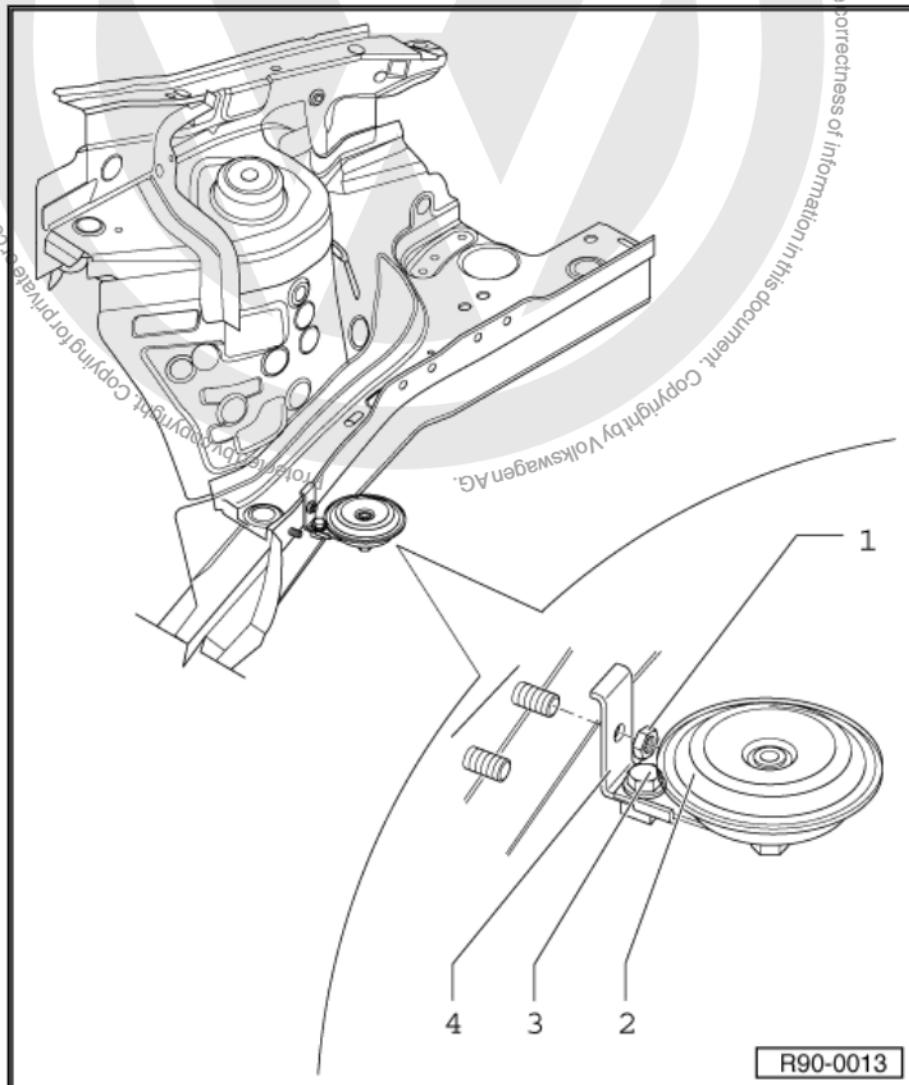
- Tighten the fixing screw with the indicated torque  
[⇒ page 195](#).



## 4.4 Alarm horn for diesel engines - remove and install

### 4.4.1 Removal

- 1 - Alarm horn support securing nut
- 2 - Alarm horn
- 3 - Alarm support securing nut
- 4 - Alarm horn support



- In order to remove the alarm horn with its support, remove the fixing screw -1-.
- Disconnect the connector.

### 4.4.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fixing screw with the indicated torque  
[⇒ page 195](#).

## 4.5 Horn activator -H-

The horn activation occurs through the plastic cover located in the center of the steering wheel. Depending on the equipment, the horn activation devices integrated to the steering wheel or to the



Ignition device for the driver's airbag -N95- cannot be replaced individually.

In vehicles with airbag, replace the Ignition device for the driver's airbag -N95- ⇒ Body - internal mountings; Rep. Gr. 69 ; Occupants' protection .

On vehicles without airbag, replace the Horn activator -H- ⇒ Running gear, ??axles, ??steering; Rep. Gr. 48 ; Steering .

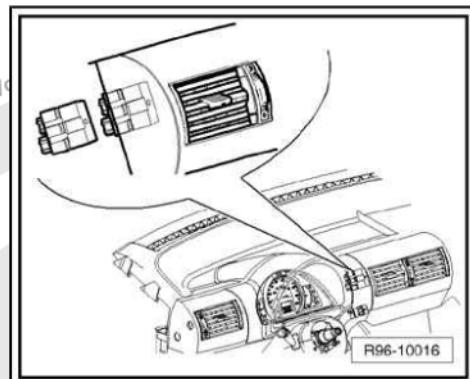


## 5      Immobilizer (up to the model 2010)

### 5.1      Immobilizer control unit - remove and install

#### 5.1.1      Removal

- Remove the upper central frame ⇒ Body - Internal assembly jobs; Rep. Gr. 70 ; Instrument panel - remove and install .
- Remove the immobilizer command unit connector and release it to remove.



#### 5.1.2      Installation

Installation is carried out in the reverse order of removal.

### 5.2      Immobilizer reading coil -D2- - remove and install

A Immobilizer reading coil -D2- is installed in the lock cylinder and cannot be replaced individually.

### 5.3      Transponder

The replacement of the transponder (response-reading memory) on the ignition key is not possible.

In case the transponder is defective, the ignition key shall be replaced.

### 5.4      Ignition key

- Replace the battery of the ignition switch with remote command ⇒ Body - external mountings; Rep. Gr. 57 ; Battery for the ignition switch with remote command - Replace battery .

#### 5.4.1      Ignition key with variable code transponder

It is not possible to replace the variable code transponder from the ignition key.

If the variable code transponder is damaged, it is necessary to replace the ignition key.



Note

*In case of replacing an ignition key or if an additional key is necessary, always adapt the new ignition key to the immobilizer  
⇒ [page 181](#).*

#### 5.4.2 Adaptation of the ignition key to the immobilizer

- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#).
- Select, on Diagnosis, Measurement and Information System -VAS 5051A/52- function **Assisted Fault Pinpointing**.
- Select the corresponding version, vehicle, model, year and engine and press **Advance**.

After consulting all command units, select the following functions:

- ◆ **Advance**
- ◆ **Go to**
- ◆ **Selection of Functions/Components**
- ◆ **Body**
- ◆ **Electrical System**
- ◆ **01-Systems capable for Self-diagnosis**
- ◆ **Immobilizer**

- Continue selecting the functions you want in Diagnosis, Measurement and Information System -VAS 5051A/52- ⇒ Vehicle diagnosis, testing and information system VAS 5051.



## 6      Immobilizer (up from model-year 2011)

### 6.1      Immobilizer control unit -J362- - replace

A Immobilizer control unit -J362- -J362- is integrated to the Combined instrument -K-. If the Immobilizer control unit -J362- is damaged, replace the entire Combined instrument -K- .

- Replace the Combined instrument -K- [⇒ page 74](#) .

### 6.2      Immobilizer reading coil -D2- - remove and install

A Immobilizer reading coil -D2- is installed in the key cylinder and cannot be replaced individually.

- If the Immobilizer reading coil -D2- is damaged, the key cylinder must be replaced [⇒ page 156](#) .

### 6.3      Ignition key - variable code transponder



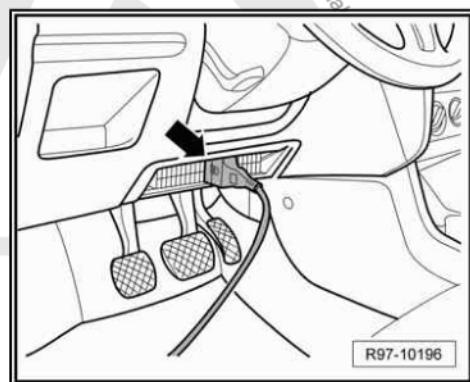
#### Note

- ◆ *It is not possible to replace the variable code transponder from the ignition key.*
- ◆ *If the variable code transponder is damaged, it is necessary to replace the ignition key.*
- ◆ *In case of replacing an ignition key or if an additional key is necessary, always adapt the new ignition key to the immobilizer [⇒ page 182](#) .*

### 6.4      Ignition key - adapt to immobilizer

For adapting the ignition key to immobilizer, use the Diagnosis, Measurement and Information System -VAS 5052- .

- Connect the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97 ; Cables and wiring harnesses on the 16-pin diagnostic connector - T16- .
- Turn the ignition on.
- Turn off all electrical components.
- Proceed by selecting the desired functions ⇒ Vehicle diagnosis, testing and information system VAS 5051.



### 6.5      Ignition key - replace the Battery -A-

For replacement of Battery -A- used in the ignition key equipped with remote control, refer to: ⇒ Body - external mountings; Rep. Gr. 57 ; Front doors/ components/ central lock .



## 7 Tracker (up from model-year 2012)

Only for SpaceFox and SpaceCross vehicles

### 7.1 Tracker - assembly overview



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

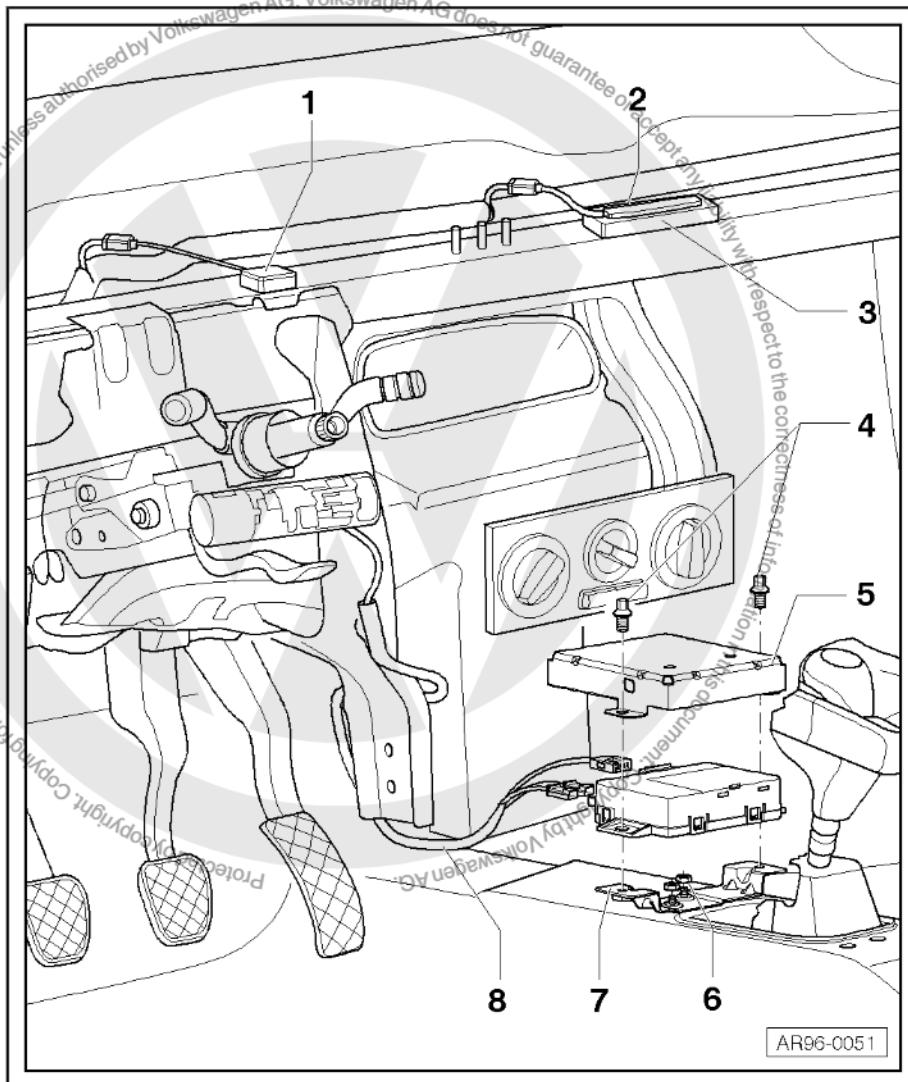


#### Note

- ◆ *Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A-.*
- ◆ *Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).*
- ◆ *When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.*

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1 -



## 7.2 Tracker antenna - remove and install

Procedure valid for GPS and GSM antennas

### 7.2.1 Removal



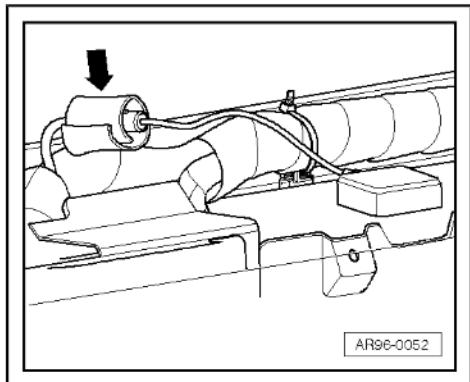
## WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

- Remove the instrument panel ⇒ Body - internal mountings; Rep. Gr. 70 ; Instrument panel - remove and install .
- Remove the centre console ⇒ Body - internal mountings; Rep. Gr. 68 ; Compartments, Covers and fittings; Central console - remove and install .



- Unroll noise insulation tape -arrow- and remove it.



AR96-0052

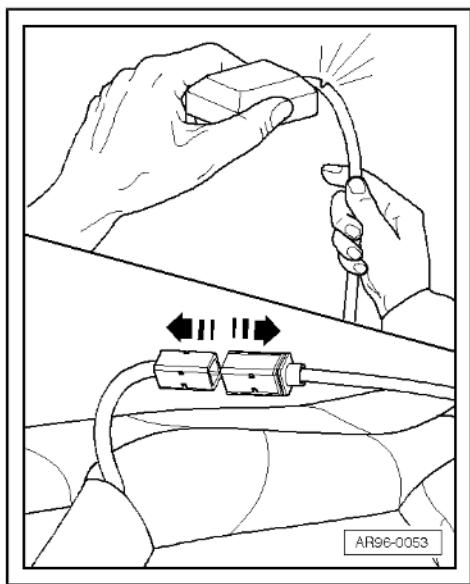
- Carefully disconnect the antenna connector.



**Note**

*Take extra care to the antenna cable. It must never be fold down, as internal filaments may break*

- Carefully remove the antenna from its base.



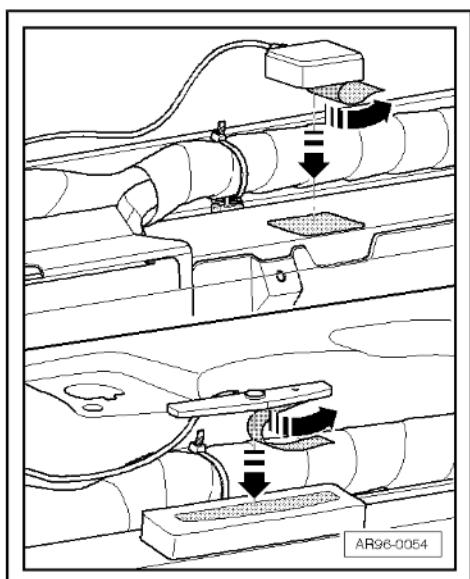
AR96-0053

## 7.2.2 Installation



**Note**

- ◆ Clean antenna housing with isopropyl alcohol.
- ◆ In case of damage, replace GSM antenna base foam.
- Remove adhesive protection, adjust and install the corresponding antenna to its housing, according to the illustration.



AR96-0064



## 7.3 Tracker - remove and install

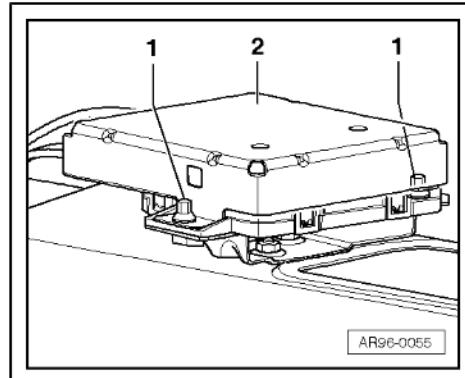
### 7.3.1 Removal



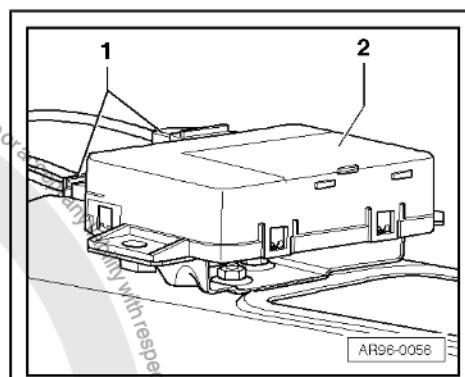
#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*

- Remove the centre console ⇒ Body - internal mountings; Rep. Gr. 68 ; Compartments, Covers and fittings; Central console - remove and install .
- Remove screws -1- and remove protective cover -2-.



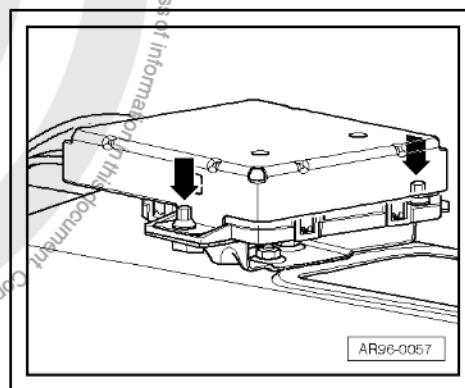
- Disengage the connectors -1- and remove the tracker -2- out of its support.



### 7.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screws -arrows- with 7 Nm.





## 8 Alarm

### General description

The anti-theft system functions are integrated to the Central control unit for the convenience system -J393- .

### Fault identification and location

The anti-theft alarm system is equipped with self-diagnosis which makes the fault location much easier.

For troubleshooting, use the Diagnosis, Measurement and Information System -VAS 5051A/52- .

- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#) .
- Select, on Diagnosis, Measurement and Information System -VAS 5051A/52- function **Assisted Fault Pinpointing**.
- Select the corresponding version, vehicle, model, year and engine and press **Advance**.



#### Note

*After the anti-theft alarm system is triggered, it is possible to consult the alarm source memorized in the Central control unit for the convenience system -J393- .*

### 8.1 Alarm - activate and deactivate

#### 8.1.1 Activation

The anti-theft alarm system is automatically activated by locking the vehicle and becomes promptly operational.



#### Note

*In order to prevent needless trigger of the anti-theft alarm system, close all doors prior to activating the lock system.*

#### 8.1.2 Deactivation

- ◆ The anti-theft alarm system is deactivated when the vehicle is unlocked through the corresponding remote command key or when the ignition is switched on.

#### 8.1.3 Manual opening of the vehicle (emergency opening)

- Open the vehicle by the driver's door.

The anti-theft alarm system remains active. The alarm, however, is not triggered.

- Switch the ignition on within the following 15 seconds.



#### Note

*Should the ignition not be switched on within 15 seconds, then the alarm is triggered.*



By switching the ignition on, the electronic immobilizer recognizes the vehicle's encoded key and deactivates the anti-theft alarm system.

## 8.2 Ultrasound sensor for the alarm system -G209- - remove and install

The Ultrasound sensor for the alarm system -G209- is composed of 2 individual sensors, cables, and a command element in the front part of the internal front light bulb, and cannot be replaced individually. The sensor shall only be replaced as a full set.

- Remove and install the internal front light [⇒ page 162](#) .



## 9 Auxiliary parking system (PDC)



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap Battery -A- .
- ◆ Upon reconnecting the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### General description

The auxiliary parking system (PDC, Park Distance Control) helps the driver park, measuring the distance between the rear bumper and the obstacle that is behind the vehicle, showing this information via an audible signal.

The auxiliary parking system has the following components:

- ◆ Control unit for parking aid -J446-
- ◆ Warning buzzer for rear parking aid -H15-
- ◆ Parking aid sensor, left rear -G203-
- ◆ Parking aid sensor, left rear, center -G204-
- ◆ Parking aid sensor, right rear, center -G205-
- ◆ Parking aid sensor, right rear -G206-

#### Fault identification and location

The auxiliary parking system is equipped with self-diagnosis device which makes fault finding easier.

For troubleshooting, use the Diagnosis, Measurement and Information System -VAS 5051A/52- .

- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#) .
- Select, on Diagnosis, Measurement and Information System -VAS 5051A/52- function **Assisted Fault Pinpointing**.
- Select the corresponding version, vehicle, model, year and engine and press **Advance**.

After consulting all command units, select the following functions:

- ◆ **Advance**
- ◆ **Go to**
- ◆ **Selection of Functions/Components**
- ◆ **Body**
- ◆ **Electrical System**
- ◆ **01-Systems capable for Self-diagnosis**
- ◆ **Auxiliary Parking System**



- Continue selecting the functions you want in Diagnosis, Measurement and Information System -VAS 5051A/52- ⇒ Vehicle diagnosis, testing and information system VAS 5051.

## 9.1 Auxiliary parking system - assembly overview

1 - Parking aid sensor, right rear -G206-

- Remove and install  
⇒ [page 193](#).

2 - Parking aid sensor, right rear, center -G205-

- Remove and install  
⇒ [page 193](#).

3 - Parking aid sensor, left rear, center -G204-

- Remove and install  
⇒ [page 193](#).

4 - Parking aid sensor, left rear -G203-

- Remove and install  
⇒ [page 193](#).

5 - Warning buzzer for rear parking aid -H15-

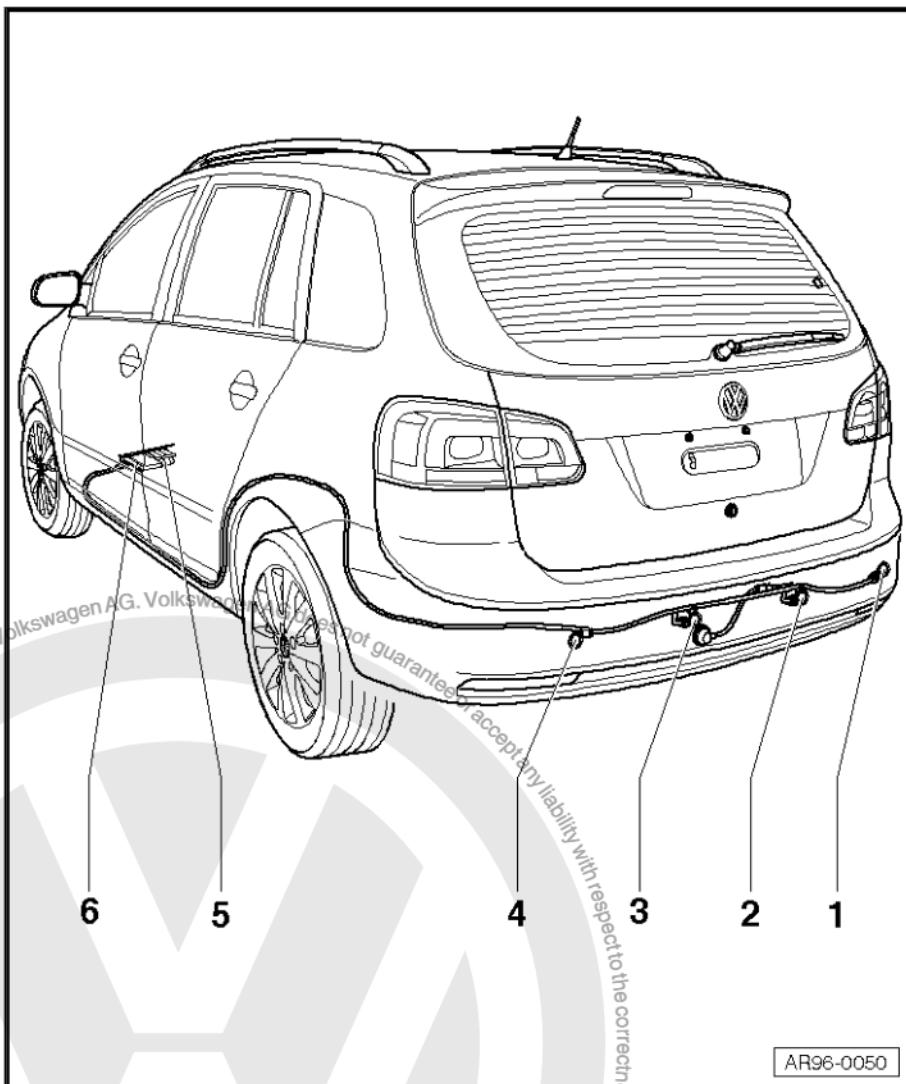
- Assembled on a support under the driver's seat.

- Remove and install  
⇒ [page 192](#)

6 - Control unit for parking aid -J446-

- Assembled on a support under the driver's seat.

- Remove and install  
⇒ [page 190](#).



## 9.2 Control unit for parking aid -J446- - remove and install

### 9.2.1 Removal

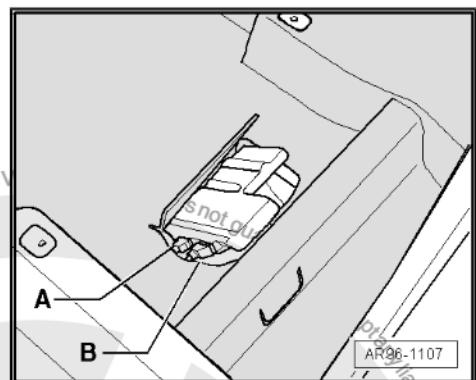
- Turn the ignition and all electrical consumers off.
- Disconnect the Battery-A- ⇒ [page 34](#).



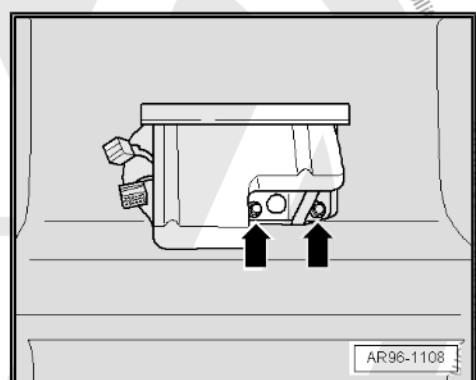
Note

- ◆ Check whether the vehicle has a code radio, if so, request the anti-theft code before disconnecting the ground cable from the Battery -A- .
- ◆ Upon reconnecting the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

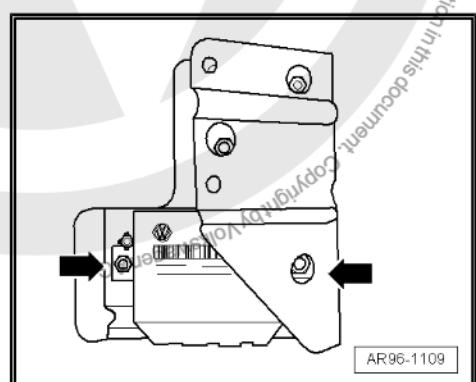
- Remove the driver's side front seat ⇒ Rep. Gr. 72 ; Front seat - removal and installation .
- Disconnect the connectors -A- and -B- from the Control unit for parking aid -J446- .



- Remove the fastening nuts -arrows- and remove it.
- Disconnect the connector from the Warning buzzer for rear parking aid -H15- .



- Remove the fastening nuts -arrows- from the Control unit for parking aid -J446- .
- Remove the Control unit for parking aid -J446- .



## 9.2.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- After the installation of Control unit for parking aid -J446- code it using Diagnosis, Measurement and Information System - VAS 5051A/52- ⇒ Vehicle diagnosis, testing and information system VAS 5051



## 9.3 Warning buzzer for rear parking aid - H15- - remove and install

### 9.3.1 Removal

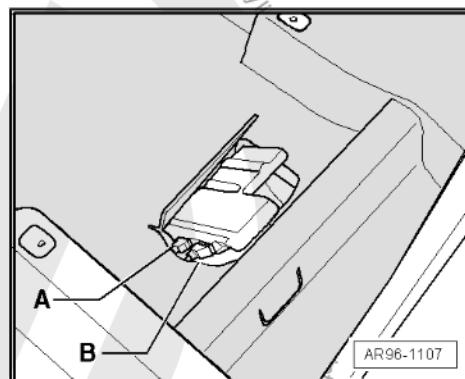
- Turn the ignition and all electrical consumers off.
- Disconnect the Battery -A- [⇒ page 34](#) .



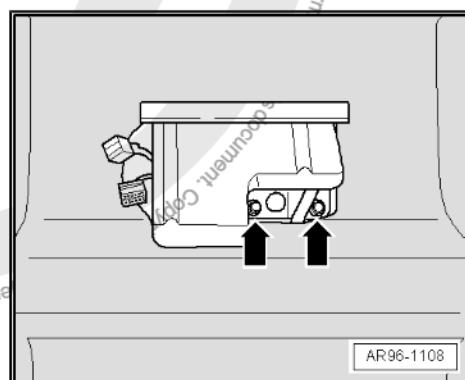
#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap Battery -A- .
- ◆ Upon reconnecting the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

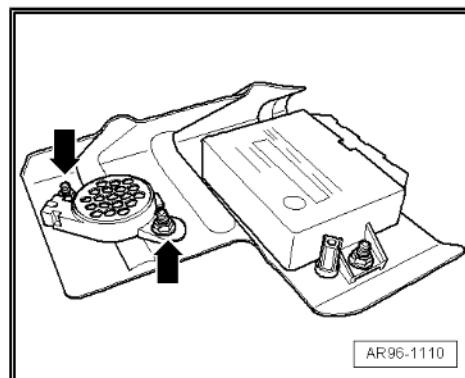
- Remove the driver's side front seat ⇒ Rep. Gr. 72 ; Front seat - removal and installation .
- Pull off connectors -A- and -B- from the Control unit for parking aid -J446- .



- Remove the fastening nuts -arrows- and remove it.
- Disconnect the connector from the Warning buzzer for rear parking aid -H15- .
- Remove the control unit's support.



- Remove the fastening nuts -arrows- from the Warning buzzer for rear parking aid -H15- .
- Remove the Warning buzzer for rear parking aid -H15- .





### 9.3.2 Installation

Install by inverting the removal sequence, paying attention to the following:

- After installation, check the operation Warning buzzer for rear parking aid -H15- .

## 9.4 Auxiliary parking sensor - remove and install



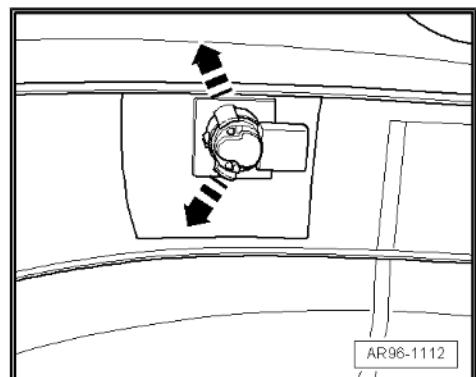
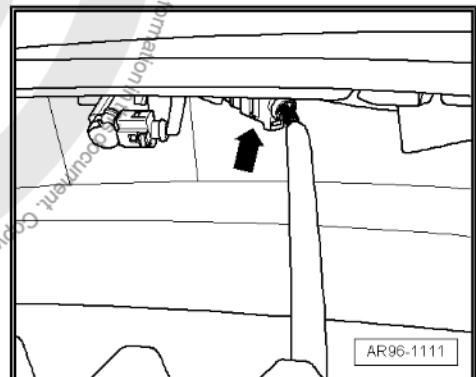
*Auxiliary parking sensor removal and installation are identical for the 4 sensors. Refer to the description of only one of the sensors.*

### 9.4.1 Removal

- Turn the ignition and all electrical consumers off.
- Disconnect the Battery -A- [page 34](#) .



- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the Battery's earth strap Battery -A- .
- ◆ Upon reconnecting the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.
- Remove rear protector ⇒ Rep. Gr. 63 ; Rear protection - remove and install .
- Pull off connector -arrow- of the main harness of Parking aid sensor, right rear, center -G205- .
- Disconnect the connector of the Parking aid sensor, right rear, center -G205- .



- Release the locks, moving them towards the arrows and remove Parking aid sensor, right rear, center -G205- pulling it out of its housing.



#### 9.4.2 Installation

Install by inverting the removal sequence, paying attention to the following:



##### Note

- ◆ The supports and sensors are supplied without painting.
- ◆ Sensor supports must be glued before the bumper lining is painted and the sensors must be painted before assembly.
- ◆ Sensors can only be painted with a 100 µm layer. You must disconnect the connector before painting the sensors.
- ◆ Avoid mechanical damages or damages caused by chemical agents to the sensors.
- ◆ Internal supports designated HLI (Hinten Links Innen - back, left side, internal) and HRI (Hinten Rechts Innen - behind, right side, internal) or external supports designated HLA (Hinten Links Aussen - behind, left side, external) and HRA (Hinten Rechts Aussen - behind, right side, external) are conceived identically. The following installation is described for one of the supports.

- Before gluing the supports for Parking aid sensor, right rear, center -G205- , gently sand the back protector's internal surface.
- Position the supports aiming to align the designation (HLA/ HRA) parallelly to the upper area of the back protector's lining.
- When gluing the support, press it firmly.





## 10 Tightening torque

Location	Tightening torque
Door contact switch	1.0 Nm
Front interior light	1.5 Nm
Horn support	11 Nm
Alarm horn support - mechanical steering	16 Nm
Alarm horn support - power steering	20 Nm





## 97 – Cables and wiring harnesses

### 1 Vehicle diagnosis, measurement and information system



#### WARNING

- ◆ *On test or measurement routes with the diagnosis, measurement and information system, there is possible risk of severe or fatal injuries.*
- ◆ *If the vehicle diagnosis and information system is placed in the airbag's radius of action during a test or measurement route and should the airbag be triggered in the case of accident, there is risk of severe or fatal injuries.*
- ◆ *Always install test and measurement equipment on the rear seat so that a second mechanic is able to use them too.*



#### Note

*All work instructions are described, such as: adaptations, coding, etc., can be done with Diagnosis, Measurement and Information System -VAS 5051A/52- .*

- Connect the Diagnosis, Measurement and Information System -VAS 5051A/52- [⇒ page 196](#)

#### 1.1 Diagnosis, Measurement and Information System -VAS 5051A/52- - connect

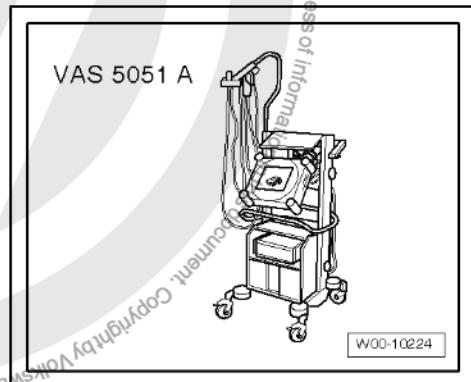


#### Note

*Pay attention to the updated instructions to operate Diagnosis, Measurement and Information System -VAS 5051A/52- , that are shown by selecting the "Administration" and "User's Manual buttons".*

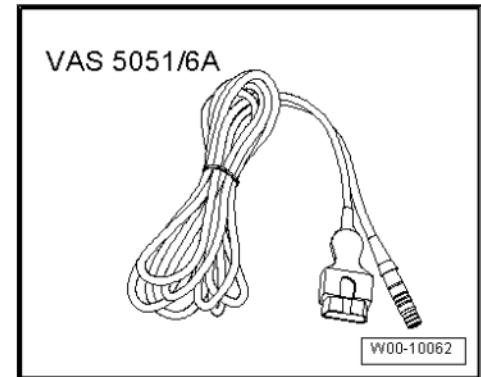
Special tools and workshop equipment required

- ◆ Diagnosis, Measurement and Information System -VAS 5051A/52-





- ◆ 5 m diagnosis cable -VAS 5051/6A-



- ◆ 3 m diagnosis cable -VAS 5051/5A-

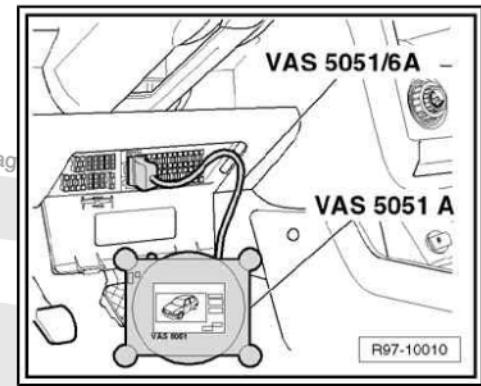
### 1.1.1 Connection

- Operate the parking brake.
- Place the gearshift lever on neutral position.
- With the ignition off, connect Diagnosis, Measurement and Information System -VAS 5051A/52- with 5 m diagnosis cable - VAS 5051/6A- to the vehicle's diagnosis terminal.
- Turn the ignition on.
- Turn off all electrical components.



#### Note

As previously described, the connection of other vehicle diagnosis, measurement and information systems is performed in the same way.





## 2 Fuse and relay support



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*



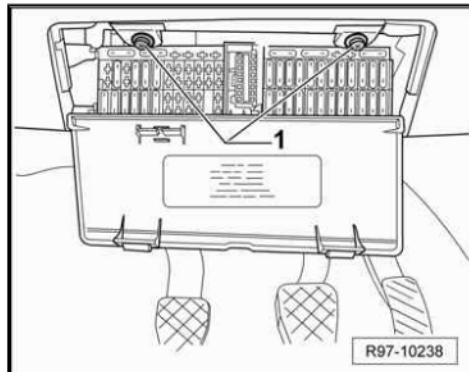
### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

### 2.1 Fuse and relay support - remove and install

#### 2.1.1 Removal

- Turn the ignition and all electric consumers off and remove the key from ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove the attaching screws -1- that fasten the fuse support to the panel.
- Remove the support by pushing it into the panel.



#### 2.1.2 Installation

Installation is carried out in the reverse order of removal.

- Tighten the fastening screws with 3.5 Nm of torque.



### 3 Coupling stations and engine compartment bellows lid



#### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

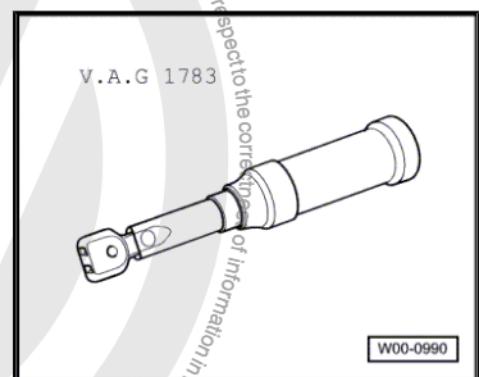


#### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A-.
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



#### 3.1 Coupling station on pillar A - assembly overview

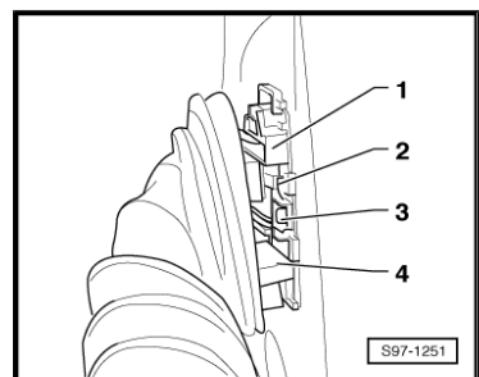


#### Note

*Replace whenever removed from body.*

Coupling station is located near the upper door hinge on pillar A.

- 1 - Voltage supply to the speaker
- 2 - Mirror
- 3 - Door contact, alert lights
- 4 - Central locking





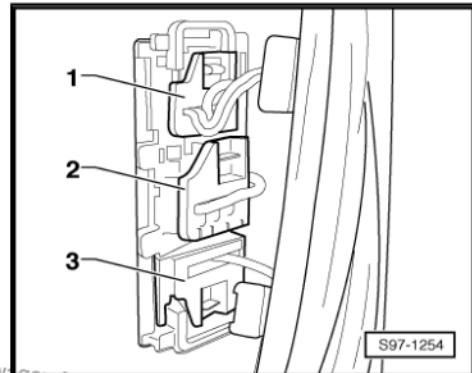
### 3.2 Coupling station on pillar B - assembly overview



*Replace whenever removed from body.*

The coupling station is located near the upper door hinge on the B pillar.

- 1 - Voltage supply to the speaker
- 2 - Door contact, alert lights
- 3 - Central locking



### 3.3 Caul lid on engine compartment partition panel - remove and install

General description:

Coupling station on engine compartment partition panel interconnects electric central in cabin with engine compartment. It is located on the left side behind the instrument panel and the windshield wiper motor.

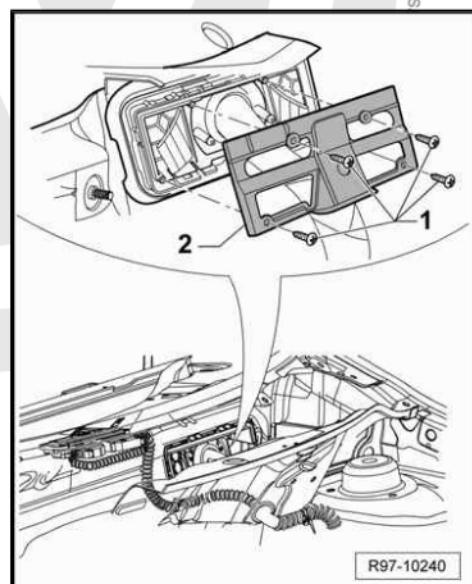
Removal:

- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Remove the windshield wiper mechanism [⇒ page 88](#) .
- Loosen the fastening screws -1- and remove lid from bellows -2-.

Installation:

Install by inverting the removal sequence, paying attention to the following:

- Tighten the fastening screws -1- with a torque of 3.5 Nm.





## 4 Fuse box



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [⇒ page 34](#).*

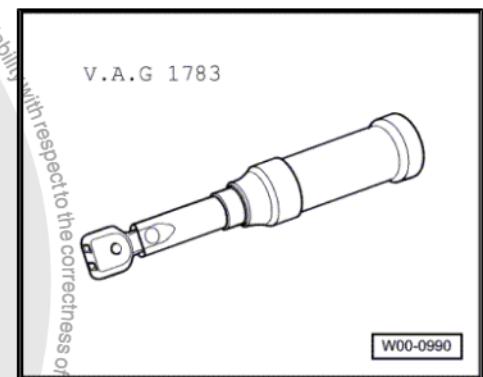


### Note

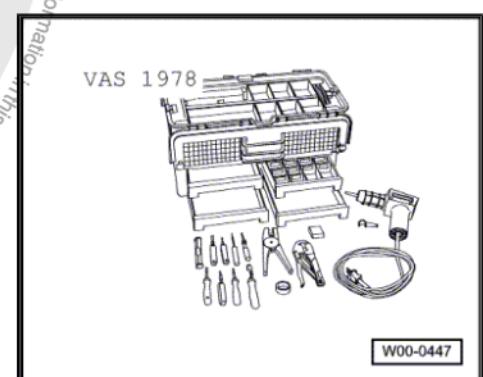
- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A-, check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

#### Special tools and workshop equipment required

- ◆ Torque wrench 2 to 10 Nm -VAG 1783-



- ◆ Harness repair set -VAS 1978-



### 4.1 Fuse box - remove and install



### Note

*The fuse box is located over the Battery -A- in the engine compartment.*

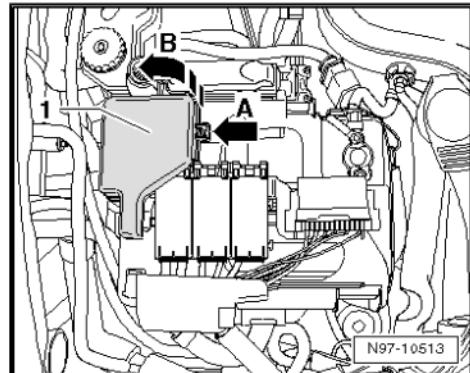


#### 4.1.1 Main fuse holder (Version 1) - remove and install

##### Removal:

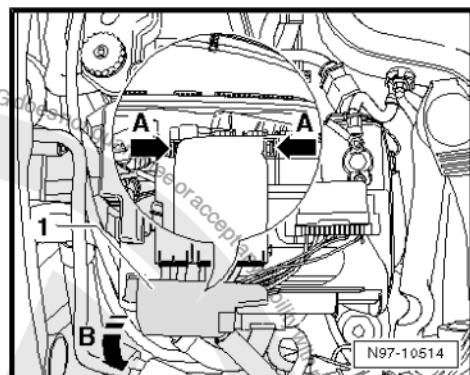
Turn the ignition and all electric consumers off and remove the key from ignition.

- Disconnect the Battery -A- [page 34](#).
- Unlock the lock -arrow A- on the cover -1- of the positive pole of the Battery -A- and move the cover -1- in the direction of -arrow B-.
- Release the locks -arrows A- on the cover -1-.

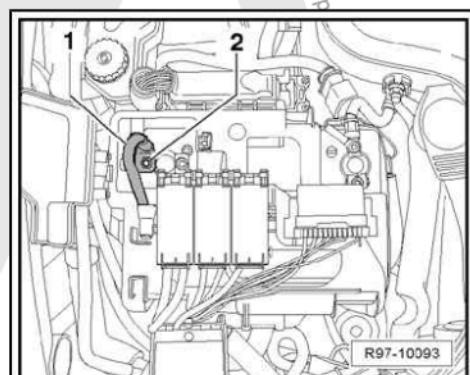


- Tilt the cover -1- in the direction of -arrow B-.

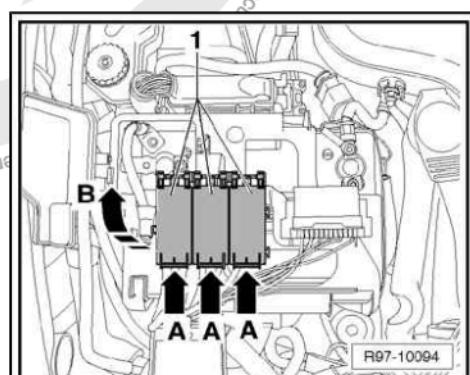
""22



- Loosen the attaching nut -2- and remove the cable (B+) -1-.

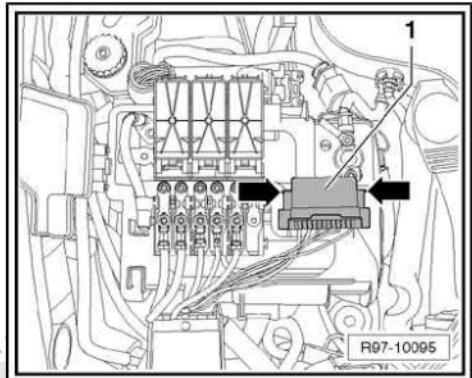


- Unlock -arrows A- the covers -1- and lift them in the direction of - arrow B-.

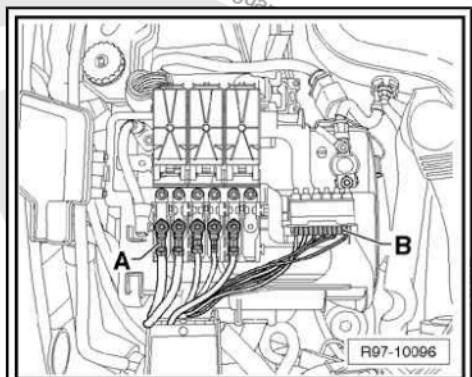




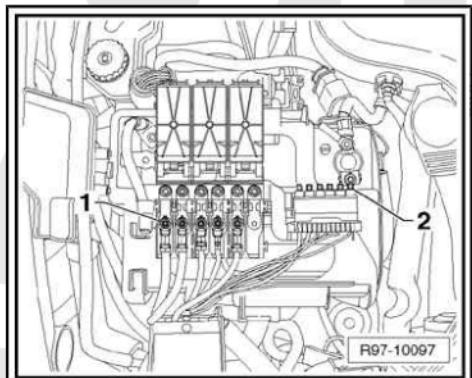
- Release the fastening locks -arrows- and remove the cover -1-.



- Identify the occupation of the cable terminals -A- with the cable terminals -B-.



- Remove the fastening nuts -1- and remove the fuses -2-.

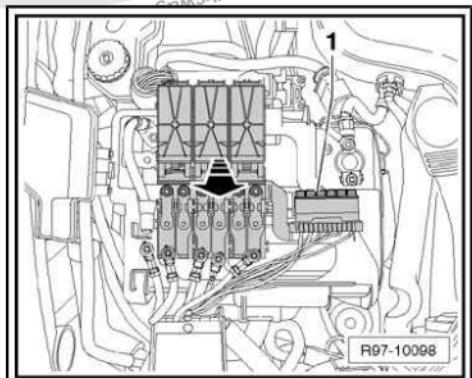


- Unlock the fuse holder -1- by moving it in direction of the -arrow-.
- Remove the cable contacts with the indicated tool in the Harness repair set -VAS 1978- .
- Remove the fuse box.

#### Installation:

Install by inverting the removal sequence, paying attention to the following:

- Ensure the correct occupation and installation of all cables to be connected.
- Tighten the fastening nuts with ( $6 \pm 1$  Nm) torque.
- Install fuses according to the electric diagram ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

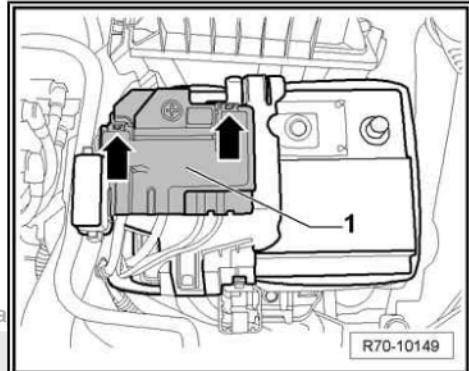




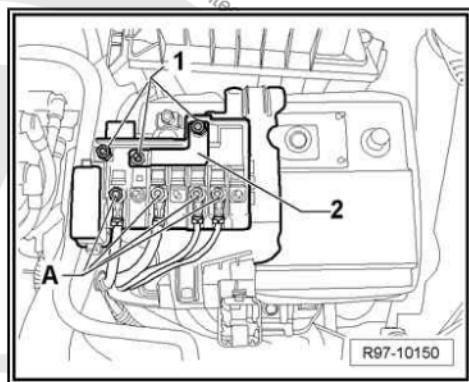
#### 4.1.2 Main fuse holder (version 2) - remove and install

Removal:

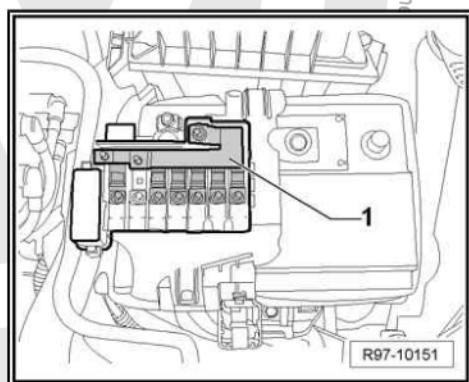
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#).
- Remove cover -1- with the aid of a screwdriver, unlocking the locks located at the -arrows-.
- Identify the arrangement (position) of the cable terminals -A- and remove them.



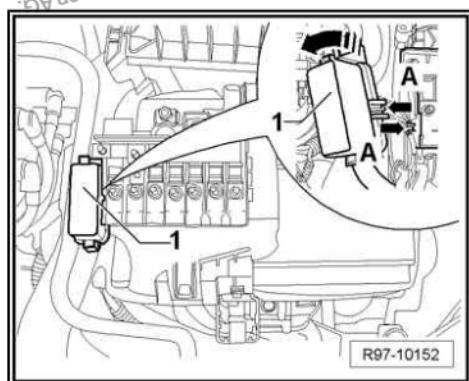
- Remove the fastening nuts -1- and the reinforcement -2-.



- Remove multiple fuse -1-.



- Remove side fuse housing -1-, detaching the locks according to -arrows A-, pulling it up.





- Loosen the locks in the direction of the -arrows- on the support -1-.

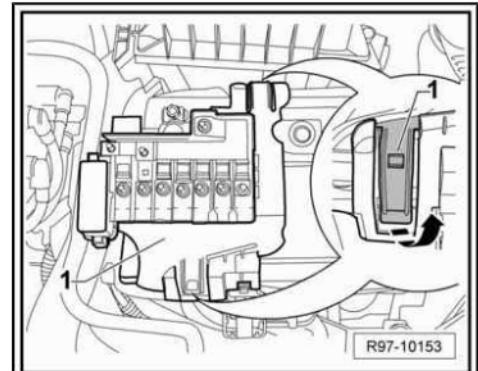
Installation:

Install by inverting the removal sequence, paying attention to the following

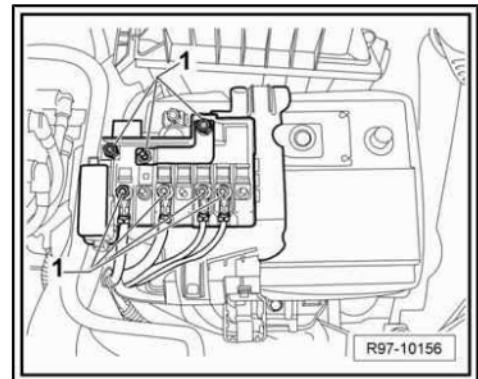


Note

- ◆ *It is imperative that all conductors/terminals are installed back in their respective locations.*
- ◆ *Install fuses according to the Electric Diagram ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*



- Tighten the fastening nuts -1- to a torque of  $9 \pm 1 \text{ Nm}$ .





## 5 Control unit



### WARNING

*Before working on the electrical system, it is necessary to disconnect the earth strap from the Battery -A- [page 34](#).*



### Note

- ◆ Check whether the vehicle has a coded radio. If so, request the anti-theft code before disconnecting the earth strap of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).
- ◆ When the Battery -A- , check the vehicle's equipment (radio, clock, electric door locks, power windows, etc.) according to the repair manual and/or instructions for use.

### 5.1 Central control unit for the convenience system -J393-

A Central control unit for the convenience system -J393- is located beneath the instrument panel, on the driver's side, and over the accelerator pedal (in vehicles with right steering wheel, over the clutch pedal).

#### General description:

A Central control unit for the convenience system -J393- is in charge of the main vehicle functions.

- ◆ Power window drive control
- ◆ Power window drive convenience control
- ◆ Vehicle self-locking control at 15 km/h
- ◆ Self-unlocking control when removing key from ignition
- ◆ Specific adjusting control in function of the country for the alarm system
- ◆ Radiofrequency receiver on remote control
- ◆ Audible signal control when locking and unlocking the vehicle
- ◆ Light signal control when locking and unlocking the vehicle
- ◆ Internal cabin lighting control
- ◆ Internal cabin pressure relief control

When the Central control unit for the convenience system -J393- is damaged or defective, replace it ⇒ Body - external mountings; Rep. Gr. 57 ; Front doors/components/central locking .



**i** Note

- ◆ After installing the new Central control unit for the convenience system -J393-, it is necessary to codify and adapt the remote control.
- ◆ For coding and adaptation, use the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97; Cables and wiring harnesses.

## 5.2 Control unit of lights with windshield wiper functions -J917-

A Control unit of lights with windshield wiper functions -J917- is located behind relay holder.

General description:

A Control unit of lights with windshield wiper functions -J917- is responsible for the vehicle's following feature:

- ◆ External lighting control

Troubleshooting and indication of defects:

A Control unit of lights with windshield wiper functions -J917- is provided with self-diagnosis function.

To locate defects, the Diagnosis, Measurement and Information System -VAS 5052- .

- Connect the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97; Cables and wiring harnesses on the 16-pin diagnostic connector - T16- .

### 5.2.1 Control unit of lights with windshield wiper functions -J917- - remove and install

Removal:

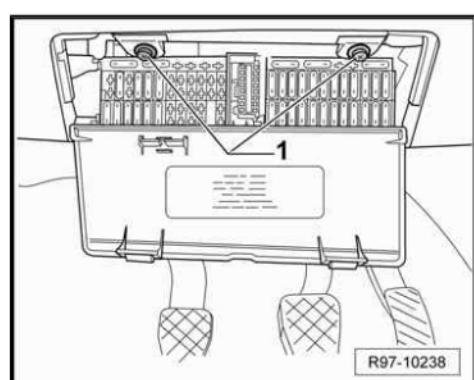
- Turn the ignition and all electric components off and remove the key from the ignition.
- Disconnect the Battery -A- [⇒ page 34](#) .
- Loosen support -2- from the Control unit of lights with windshield wiper functions -J917- -3- behind instrument panel -1- .
- Pull off connectors -4- .
- Remove the Control unit of lights with windshield wiper functions -J917- -1- .

Installation:

- Install in reverse order

**i** Note

- ◆ After installing the new Control unit of lights with windshield wiper functions -J917-, perform its coding
- ◆ To do that, use the Diagnosis, Measurement and Information System -VAS 5052- ⇒ General information; Rep. Gr. 97; Cables and wiring harnesses





## 6 Repairs of wiring harnesses and connections

### 6.1 Wiring harness repair set

#### 6.1.1 Harness repair set -VAS 1978-

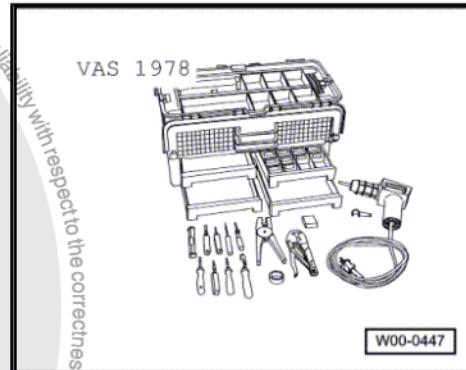
The Harness repair set -VAS 1978- allows for optimal electric system repair. The tools allow performing repairs on the area of connectors and, in case of interruption, of cables. Complete repair cables are therefore used, with fixed terminals and connected to the original vehicle harness by means of pressure connections. Pressure pliers with three compression cavities and a thermal blower for connection retractions ensure a perfect electric connection.



Note

*Further information:*

Instruction manual Harness repair set -VAS 1978-

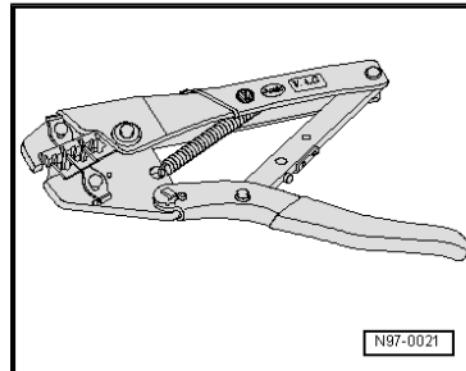


### 6.2 Description of tools

#### 6.2.1 Pressure pliers with fit

The Crimping pliers without insertion element -VAS 1978/1- together with Insertion element for crimping pliers -VAS 1978/2- are part of Harness repair set -VAS 1978- and compress the connections using pressure when repairing the harnesses.

Color of the compression connection	Color of the compression cavity	Cross section
yellow	yellow	0.35 mm <sup>2</sup>
red	red	0.5 mm <sup>2</sup> - 1.0 mm <sup>2</sup>
blue	blue	1.5 mm <sup>2</sup> - 2.5 mm <sup>2</sup>
yellow	yellow	4.0 mm <sup>2</sup> - 6.0 mm <sup>2</sup>



Note

- ◆ *It is vital to ensure the use of the correct compression cavity for the corresponding pressure connection.*
- ◆ *The cable sheath shall not be compressed.*



## 6.2.2 Disassembly tool for terminals

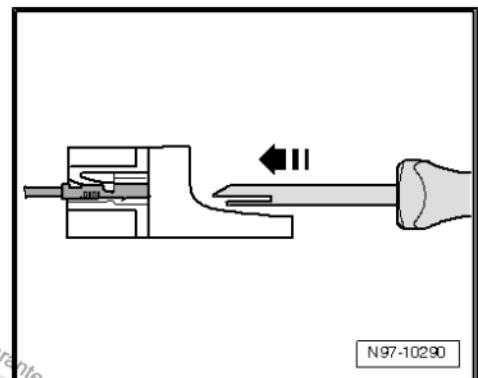
The different disassembly tools have the function of correctly disassembling the different types of terminals.

A series of disassembly tools are part of Harness repair set -VAS 1978- .



### WARNING

*Some tools have a safety lock which shall be inserted on the tool ends after use in order to prevent damages to the tool and to protect the mechanic against eventual injuries.*



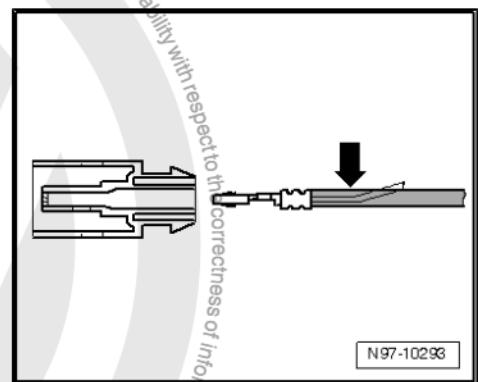
Disconnect and disassemble terminals [⇒ page 224](#) .

## 6.2.3 Assembly tool for single cable sheaths

The assembly tool allows the insertion of single cable sheaths to the connector up to the stopper without damaging, as to ensure complete insulation between cable and connector.

Are included in Harness repair set -VAS 1978- four assembly tools for single cable sheaths.

Assembly of single cable sheaths [⇒ page 221](#) .



## 6.2.4 Wire stripper -VAS 1978/3-

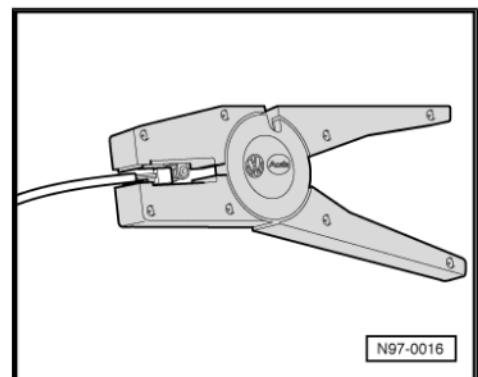
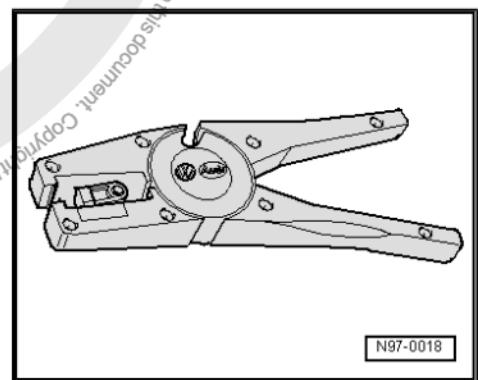
The Wire stripper -VAS 1978/3- allows cable uncovering and cutting.

The Wire stripper -VAS 1978/3- is part of Wiring harness repair set -VAS 1978- .

The Wire stripper -VAS 1978/3- is provided with an adjustable limiter which allows adjusting the intended length of the sheath to be removed from the cable.

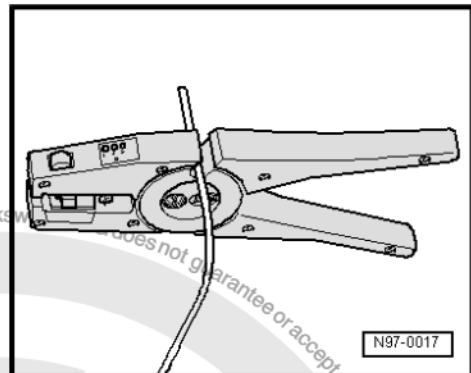
Stripping:

- Place the removable limiter on the wire stripper at the intended measurement in relation to the sheath length to be stripped.
- Fit the cable end from the front up to the limiter and press the wire stripper.
- Open the wire stripper again and remove the stripped cable end.





- If necessary, cut the cable with the side function on the upper part of the Wire stripper -VAS 1978/3- .



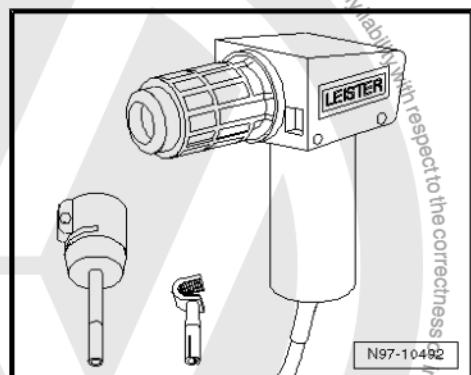
### 6.2.5 Hot air blower (220V/50Hz) -VAS 1978/14-



#### Caution

*By retraction of the connection due to pressure, it is important to ensure the hot air blower does not damage other cables, plastic components or any other sheath.*

*Special attention shall be given to the hot air blower instructions manual!*



The Hot air blower (220V/50Hz) -VAS 1978/14- is assembled with Adaptor for hot air blower -VAS 1978/15- to retract the connection by pressure to keep moisture out.

The Hot air blower (220V/50Hz) -VAS 1978/14- is part of Harness repair set -VAS 1978- .

### 6.3 General notes on repair works on the vehicle electrical system



#### Caution

*To disconnect and connect the Battery -A- , it is required to strictly observe the procedures described in the repair manual [⇒ page 34](#) .*



#### WARNING

*Some tools have a safety lock which shall be inserted on the tool ends after use in order to prevent damages to the tool and to protect the mechanic against eventual injuries.*

- ◆ Whenever repair works are performed, refer to the updated information in the corresponding Workshop Manuals.
- ◆ Pay attention to the specific rules in force in each country.
- ◆ Before working on the electrical system, disconnect the ground cable of Battery -A- .
- ◆ Safe working conditions, with regards to the electrical system, are attained by disconnecting the earth strap from the Battery -A- (interruption of electric current).



- ◆ It is required only the disconnection of the positive cable of Battery -A- so as to remove the Battery -A- .
- ◆ Prior to starting any repair work, it is vital to remove any possible fault cause (e.g., sharp body components, defective consumers, corrosion, etc).
- ◆ No welding work is allowed on repairs which are performed on the on board network.
- ◆ Harness and terminal repairs can only be done with Harness repair set -VAS 1978- .
- ◆ Repairs on harnesses shall be performed with yellow cables only.
- ◆ Repairs on harnesses shall not be built in again to the vehicle original cable sheath and shall be identified with yellow adhesive tape.
- ◆ These yellow cables and all points marked with yellow adhesive tape indicate previous repairs.
- ◆ The pressure connections can not be repaired. If necessary, place a parallel cable to the damaged cable.
- ◆ After compression, perform the retraction of the connection by pressure with the hot air blower in order to prevent entrance of moisture.
- ◆ Pay special attention to the complementary notes on repair work of airbag cables and seat belt pre-tensioners, CAN-Bus system cables, antenna cables and cables with cross-section up to 0.35 mm<sup>2</sup> [⇒ page 212](#) .
- ◆ Avoid loosening any ground cables from the body (danger of corrosion).
- ◆ After each repair, perform an operation test. If necessary, consult and delete the fault memory and/or initialize or perform adjustments on the systems.

#### 6.4 Wiring harness repairs



##### Note

- ◆ *Pay attention to the notes related to electrical system repair jobs [⇒ page 210](#) .*
- ◆ *In the Harness repair set -VAS 1978- not all transversal cable sections available in the vehicle are not contained. Should the required cross section not be available, use the next cross section (larger).*



#### 6.4.1 Notes on repair work on harnesses



##### Note

- ◆ *No welding work is allowed on repairs which are performed on the on board network.*
- ◆ *Harness and terminal repairs can only be done with Harness repair set VAS 1978-.*
- ◆ *Repairs on harnesses shall be performed with yellow cables only.*
- ◆ *Repairs on harnesses shall not be built in again to the vehicle original cable sheath and shall be identified with yellow adhesive tape.*
- ◆ *These yellow cables and all points marked with yellow adhesive tape indicate previous repairs.*
- ◆ *The pressure connections can not be repaired. If necessary, place a parallel cable to the damaged cable.*
- ◆ *After compression, perform the retraction of the connection by pressure with the hot air blower in order to prevent entrance of moisture.*
- ◆ *Armored cables can not be repaired. In case of damage, they shall be fully replaced.*
- ◆ *Heat resistant cables are installed at various points of the vehicle, mainly at the engine compartment. When performing repair work on these cables, only heat resistant cables shall be used.*
- ◆ *Pay special attention to the complementary notes on repair work of airbag cables and seat belt pre-tensioners, CAN-Bus system cables, antenna cables and cables with cross-section up to 0.35 mm<sup>2</sup> ➤ [page 212](#).*
- ◆ *Avoid loosening any ground cables from the body (danger of corrosion).*
- ◆ *After each repair, perform an operation test. If necessary, consult and delete the fault memory and/or initialize or perform adjustments on the systems*

Complementary notes on repair work on airbag cables and seat belt pre-tensioners ➤ [page 212](#).

Complementary notes on cable repairs of the CAN-Bus system ➤ [page 215](#).

Complementary notes on replacement of antenna cables ➤ [page 215](#).

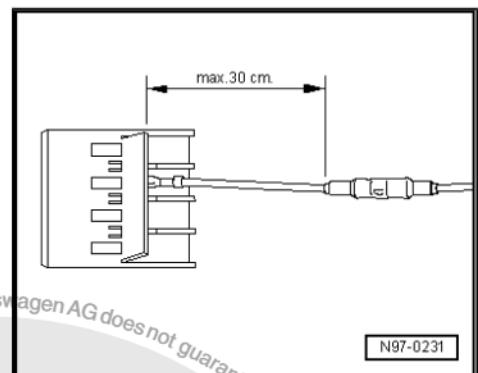
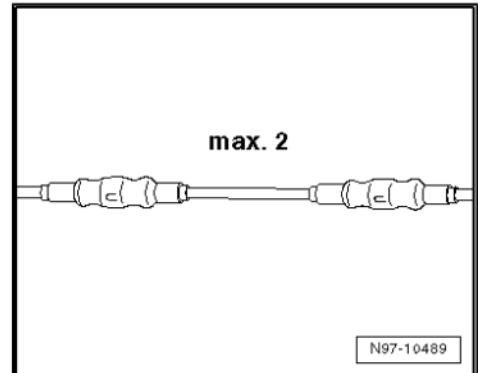
#### 6.4.2 Repair of airbag cables and seat belt pre-tensioners

For complementary repairs of the airbag cables and seat belt pre-tensioners, pay attention to the following indications:



**WARNING**

- ◆ *Poorly performed repair work on airbag cables and seat belt pre-tensioners may cause faults to the protection system for occupants.*
- ◆ *When performing repair work at airbag cables and seat belt pre-tensioners, only use terminals, connectors and cables which are foreseen for this purpose ⇒ Electronic Parts Catalogue (ETKA).*

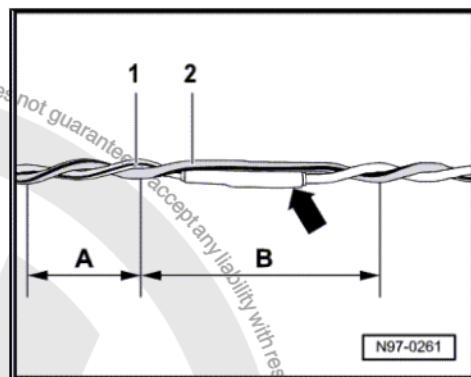


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**Note**

- ◆ Airbag and pre-tensioner cables can only be repaired with Harness repair set -VAS 1978.
- ◆ Observe the adhesive on the vehicle that indicate high voltage parts. In case of repair work, residual voltage shall be discharged.
- ◆ More than two regions on the airbag cable and seat belt pre-tensioners shall not be repaired. Repair regions increase the electrical resistance of the cable and may cause faults of the self-diagnosis system.
- ◆ In the case of repair work on airbag cables or seat belt pre-tensioners, the connection by pressure shall be subject to retraction in order to avoid corrosion.
- ◆ Repairs on harnesses shall be performed with yellow cables only.
- ◆ Repairs on harnesses shall not be built in again to the vehicle original cable sheath and shall be identified with yellow adhesive tape.
- ◆ These yellow cables and all points marked with yellow adhesive tape indicate previous repairs.
- ◆ Repair work which are performed on the airbag or seat belt pre-tensioners regions shall have maximum spacing of 30 cm to the next contact box. This procedure allows, along with the identification with yellow adhesive tape, prompt check of the repair regions.
- ◆ The command unit cables (Airbags) have a series torsion pitch of 20 mm  $\pm 5$ . This pitch is ensured during series production, through the normative numbers for the pairs of cables, and it shall be kept at length repair of twisted cables.
- ◆ When performing repair works, the command unit cables (Airbags) shall present the same length. When torsioning cables -1- and -2- it is mandatory to keep the pitch of A = 20 mm  $\pm 5$ .
- ◆ There may be no repair on the cable -arrow- that may cause a length of more than B = 100 mm without the cables being torsioned.



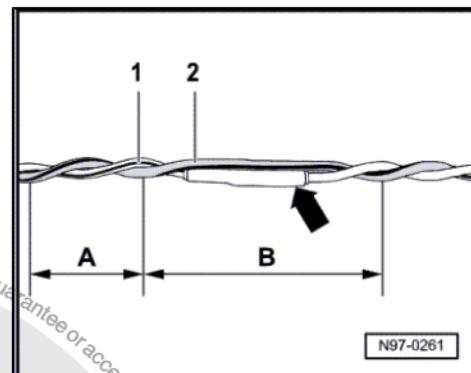
N97-0261



### 6.4.3 Repair of CAN-Bus system cables

- ◆ As the CAN-Bus cable, an unprotected two-wire cable -1- and -2- is used with a transversal section of  $0.35 \text{ mm}^2$  or  $0.5 \text{ mm}^2$ .
- ◆ Color codes of CAN-Bus system cables:

Cable CAN-High, command	orange/black
Cable CAN-High, Comfort system	orange/green
Cable CAN-High, Infotainment	orange/violet
Cable CAN-Low (all)	orange/brown



N97-0261

- ◆ In addition to the repair cables on the respective transversal section, the CAN-Bus system can be repaired with "green/yellow" or "white/yellow" torsioned cables from parts catalogue ⇒ Electronic Parts Catalogue (ETKA).
- ◆ When performing repair work, both CAN-Bus cables shall have the same length. When torsioning cables -1- and -2- keep the pitch of  $A = 20 \text{ mm}$ .
- ◆ There may be no repair on the cable -arrow- that may cause a length of more than  $B = 50 \text{ mm}$  without the cables being torsioned.
- ◆ Apply the yellow adhesive tape on the repair regions in order to identify previous repair work.

### 6.4.4 Replacement of antenna cables

A new repair concept has been developed to repair antenna cables. Connection cables with various lengths and distinct adapters are available as spare parts in place of the complete conventional cables.

#### General description

- ◆ Antenna cables can not be repaired and shall be replaced exclusively by connection cables and adapters that belong to the original spare parts.
- ◆ The replacement parts are listed in the ⇒ Electronic Parts Catalogue (ETKA).
- ◆ Terminals of the antenna cable connectors are available as spare parts in one single color that can be used for connectors of any color, however.
- ◆ Replacement of individual antenna connectors is not foreseen in repair cases.
- ◆ From now on shall connection cables be used on all VW models with all antenna cable diameters.
- ◆ All adapters and connection cables suit all emission and reception signals.
- ◆ This repair concept can also be applied for checking or late assembly.



## Overview of an antenna cable assembly

Example: damaged radio antenna cable to antenna. The following cables are necessary for the repair:

- 1 - Adapter cable for radio connection; approx. length 30 cm.
- 2 - Connection cable; available in various lengths.
- 3 - Adapter cable for connection to antenna; approx. length 30 cm.

## Assembly of a new antenna cable



### Note

*Depending on the vehicle equipment, the total length of an antenna cable may be divided in partial sections by the antenna control unit, traffic information system or the antenna amplifiers. Only replace the damaged section.*

- Disconnect the damaged antenna cable connectors of the corresponding units.
- Determine the route of the damaged antenna cable on the vehicle and measure the total cable length that is to be installed in the vehicle.

The total length of the antenna cable results from the length of the adaptation cables of the required antennas -1- and -3-, as well as from connection cable -2-.

- Discount 60 cm of the established total length of antenna cable in order to obtain the required length for the connection cable -2-.
- Request the required adaptation cables -1- and -3- and connection cable -2- with the calculated length to the replacement part service, as per the part catalogue.
- Cut off the damaged antenna cable connectors.

The remaining damaged antenna cable remains in the vehicle.

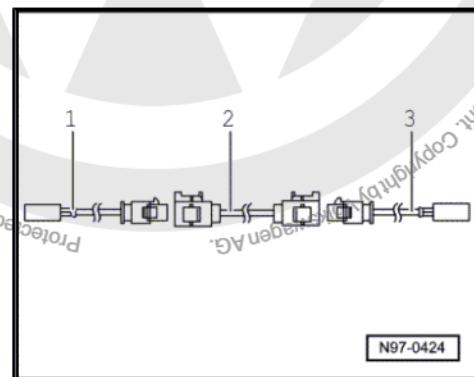
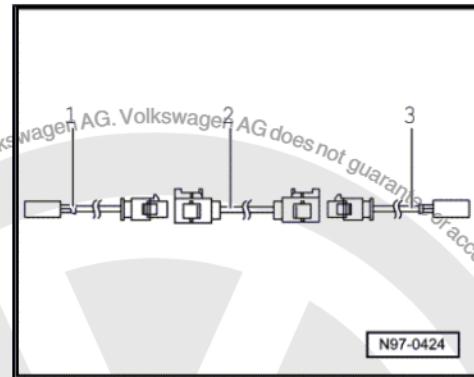
- Connect adaptation cables -1- and -3- to the vehicle's units.
- Install connection cable -2- near the vehicle antenna cable's original arrangement.



### Note

*Antenna cables shall not be fold or excessively twisted! The curve shall not exceed 50 mm.*

- Connect connection cable -2- with adaptation cables -1- and -3-.
- Check the system function.

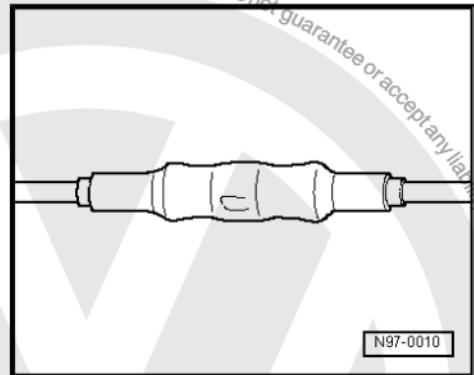




#### 6.4.5 Interruption on cables with one repair region

Repair region with a connection by pressure.

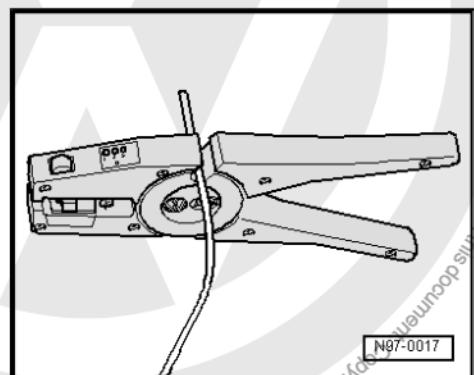
- Loosen the cable that is to be repaired (approx. 20 cm to both sides of the repair region).
- If necessary, remove the cable sheath with a pocket knife.



- Cut the damaged part of the original single cable using Wire stripper -VAS 1978/3- .



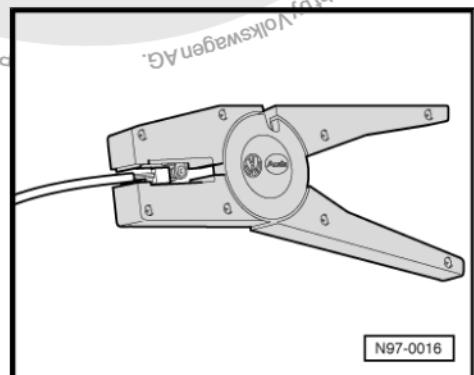
*When by cutting the damaged cable, the original single cable ends remain too short for repair with an individual connection by pressure, place a repair cable with the required length with two connections by pressure ⇒ [page 218](#) .*



- Uncover 6 to 7 mm from the tips with Wire stripper -VAS 1978/3- .
- Insert the connection per pressure in both uncovered tips of the original single cable and compress with Crimping pliers without insertion element -VAS 1978/1- .



- ◆ *It is vital to ensure the use of the correct compression cavity for the corresponding pressure connection ⇒ [page 208](#) .*
- ◆ *The cable sheath shall not be compressed.*



After compression, perform the retraction of the connection by pressure with the hot air blower in order to prevent entrance of moisture.

- Mount the Adaptor for hot air blower -VAS 1978/15- on the Hot air blower (220V/50Hz) -VAS 1978/14- .



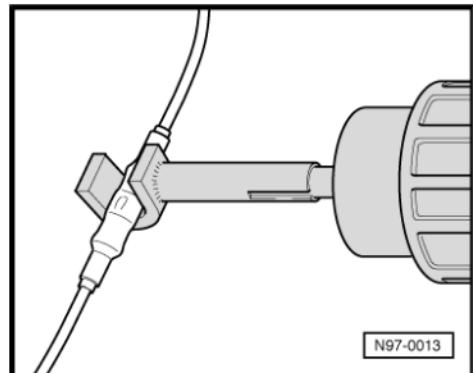
- Heat the connection by pressure with the hot air blower in longitudinal direction, from the center to the end, until fully sealing and the glue starts leaking at the ends.



**Caution**

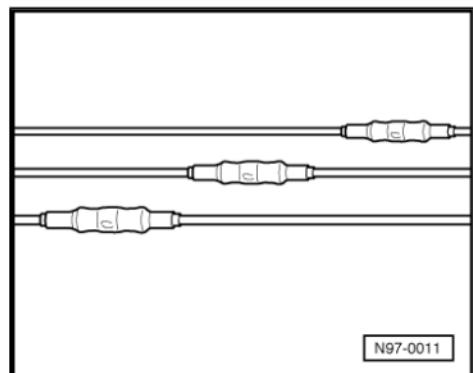
*By retraction of the connection due to pressure, it is important to ensure the hot air blower does not damage other cables, plastic components or any other sheath.*

*Special attention shall be given to the hot air blower instructions manual!*



**Note**

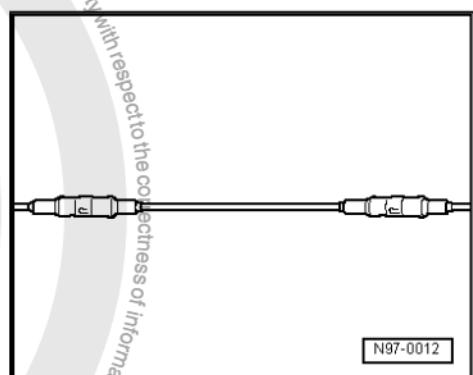
- ◆ *In case more than one cable is to be repaired, make sure that the connections by pressure are not placed together. In order to prevent that cable regions occupy too much space, position the connection by pressure slightly displaced.*
- ◆ *In case the repair region was covered, cover it again with yellow adhesive tape after repair.*
- ◆ *If necessary, fix the repaired cables with a clamp, thus avoiding further noises when driving the vehicle.*



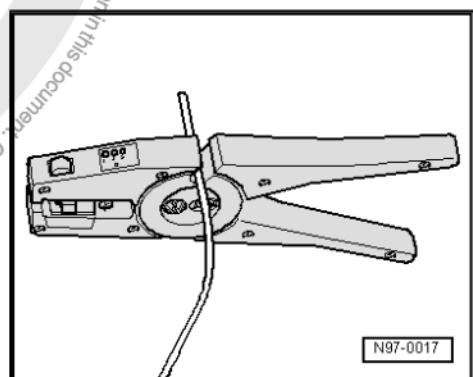
#### 6.4.6 Interruption on cables with two repair sections

Repair region with the cable in central region.

- Loosen the cable that is to be repaired (approx. 20 cm to both sides of the repair region).
- If necessary, remove the cable sheath with a pocket knife.



- Place the yellow repair cable near to the damaged cable and cut the required length of the repair cable with Wire stripper - VAS 1978/3- .
- Cut the damaged part of the original single cable.



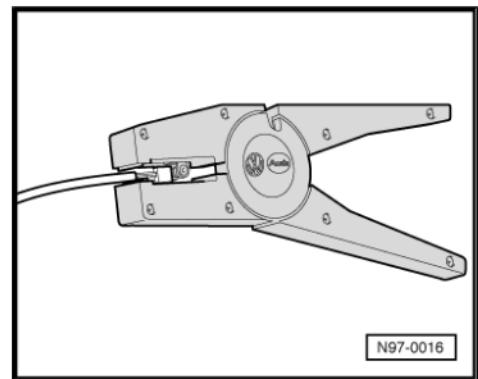


- Uncover 6 to 7 mm from the tips with Wire stripper -VAS 1978/3- .
- Apply one end of the connection by pressure to the original single cable and the other on the repair cable.
- Compress the pressure connection to the tow tips of the cable using Crimping pliers without insertion element -VAS 1978/1- .
- Repeat this operation at the other end of the repair cable.



Note

- ◆ *It is vital to ensure the use of the correct compression cavity for the corresponding pressure connection ⇒ [page 208](#) .*
- ◆ *The cable sheath shall not be compressed.*



After compression, perform the retraction of the connection by pressure with the hot air blower in order to prevent entrance of moisture.

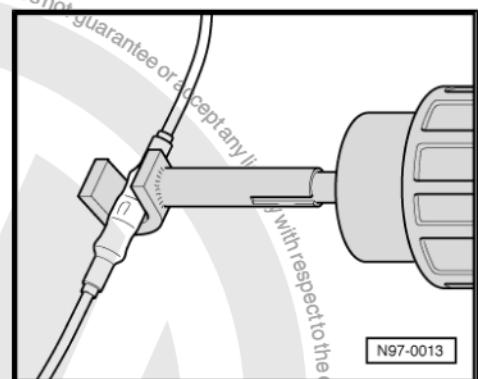
- Mount the Adaptor for hot air blower -VAS 1978/15- on the Hot air blower (220V/50Hz) -VAS 1978/14- .
- Heat the connection by pressure with the hot air blower in longitudinal direction, from the center to the end, until fully sealing and the glue starts leaking at the ends.



Caution

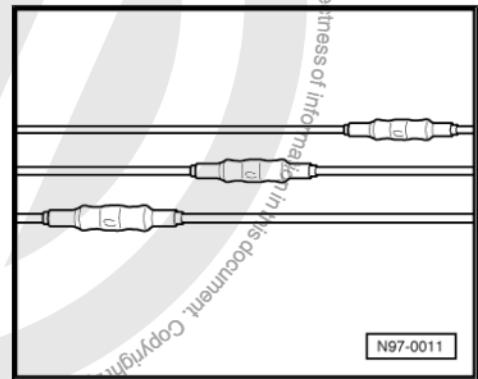
*By retraction of the connection due to pressure, it is important to ensure the hot air blower does not damage other cables, plastic components or any other sheath.*

*Special attention shall be given to the hot air blower instructions manual!*



Note

- ◆ *In case more than one cable is repaired, make sure that the connections by pressure are not placed together. In order to prevent that cable regions occupy too much space, position the connection by pressure slightly displaced.*
- ◆ *In case the repair region was covered, cover it again with yellow adhesive tape after repair.*
- ◆ *If necessary, fix the repaired cables with a clamp, thus avoiding further noises when driving the vehicle.*





## 6.5 Repair of connectors terminals

### 6.5.1 Notes on repair work on the connector terminals and connectors

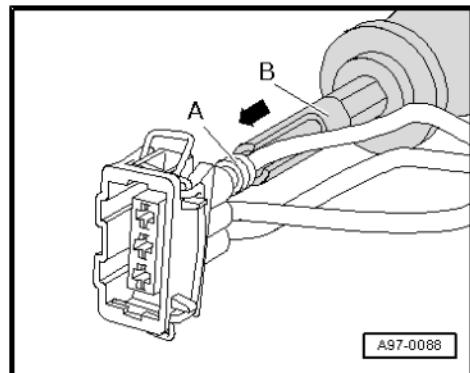
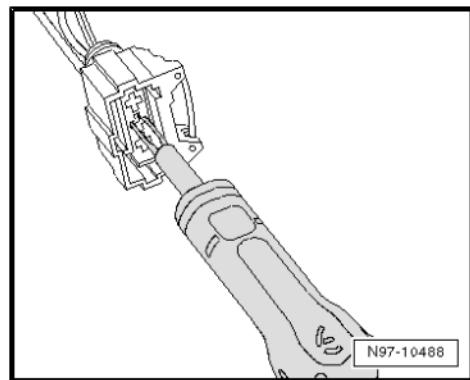


#### Note

- ◆ Pay attention to the notes related to electrical system repair jobs [⇒ page 210](#).
- ◆ The correspondence of the crimping terminals to the corresponding connectors is established in accordance to the part number engraved on the corresponding connector ⇒ *Electronic Parts Catalogue (ETKA)*.
- ◆ Damaged connectors shall be always replaced.

### 6.5.2 Repair of connectors terminals

- If necessary, first open or unlock the secondary lock device of the connectors' terminals [⇒ page 224](#).
- Unlock the terminal (primary unlock device) with a proper unlock tool [⇒ page 224](#).
- Pull the terminal on the single cable and remove it from the connector.
- Select the yellow repair cable with the proper terminal from Harness repair set -VAS 1978- or Wiring harness repair set - VAS 1978A-.
- Loosen the repair region of the original cable (approx. 20 cm to both sides of the repair region).
- If necessary, remove the cable sheath with a pocket knife.
- Fit the new terminal of the repair cable on the connector until it locks.
- If necessary, insert single cable lining -A- with the respective assembly tool -B- to the connector stanchion.

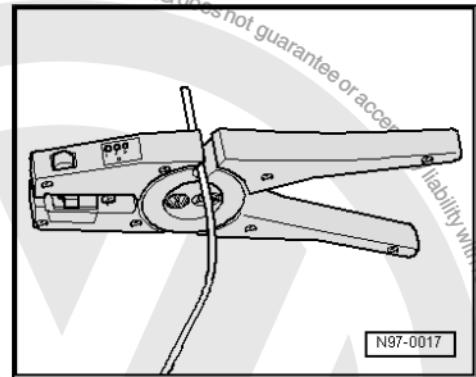


#### Note

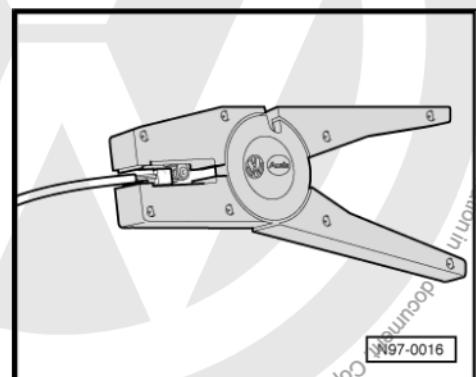
The smallest diameter of the sheath shall point to the connector.



- Shorten the repair cable and the original single cable according as necessary with Wire stripper -VAS 1978/3-

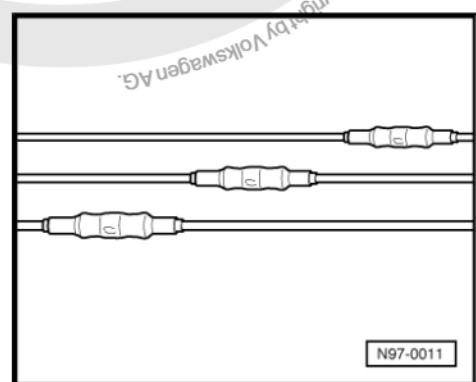


- Strip 6 to 7 mm of the repair cable ends and of the original single cable with Wire stripper -VAS 1978/3-.
- Compress the original harness' repair cable and single cable stripped tips with the crimping pliers and a pressure connection, as described in chapter "Interruption on cables with one repair region" [⇒ page 217](#).



 Note

- In case more than one cable be repaired, make sure that the connections by pressure are not placed together. In order to prevent that cable regions occupy too much space, position the connection by pressure slightly displaced.
- In case the repair region was covered, cover it again with yellow adhesive tape after repair.
- If necessary, fix the repaired cables with a clamp, thus avoiding further noises when driving the vehicle.



### 6.5.3 Assembly of single cable sheaths

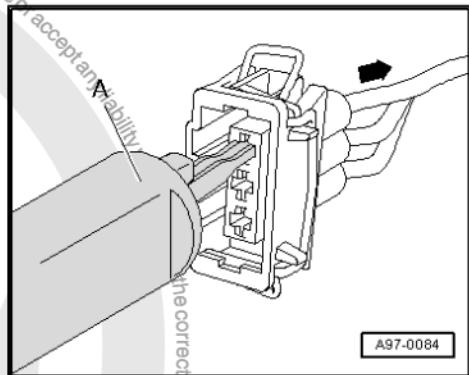
 Note

- Single cable sheaths prevent water and dirt from entering the connector. These sheaths are assembled, e.g., in the engine compartment and shall be assembled again whenever a repair is performed.
- The sheath of series single cables is engraved on the cable along with the terminal, this does not happen in case of repair. Prior to the compression of the repair cable, insert the cable sheath.
- The single cable sheaths shall be necessarily adapted to the cross section of the used repair cable. The outer diameter of the single cable sheath remains aligned to the connector chamber diameter. The assembly can only be performed with proper assembly tool.

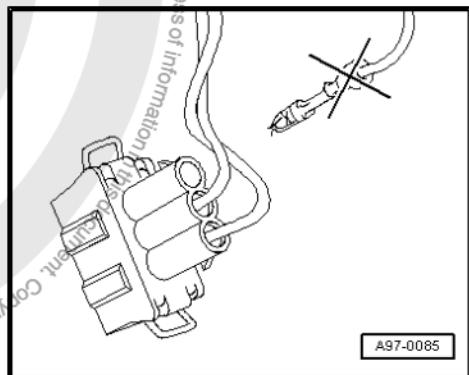


### Assembly of single cable sheaths

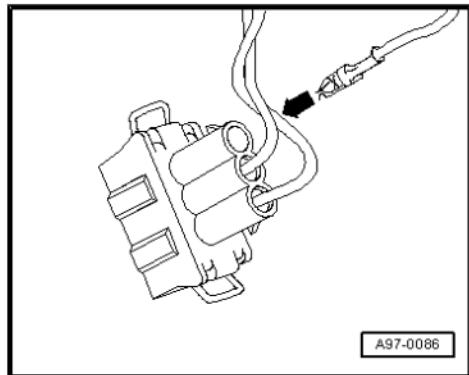
- Using the appropriate unlocking tool -A-, release the fitting from the terminal and remove the cable with the respective lining -arrow- from the connector, pulling it backwards.



- Cut the former terminal along with the corresponding sheath of the original cable.



- Fit the repair cable with the new terminal to the corresponding connector housing until it locks.



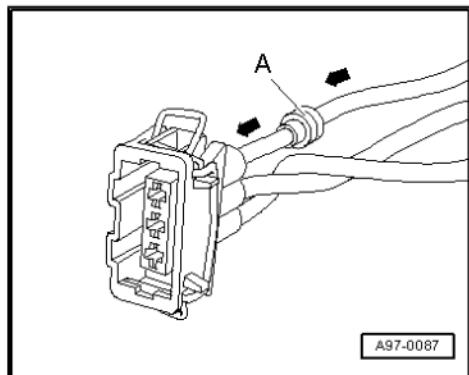
- Insert single cable lining -A- in the free tip of the repair cable.



#### Note

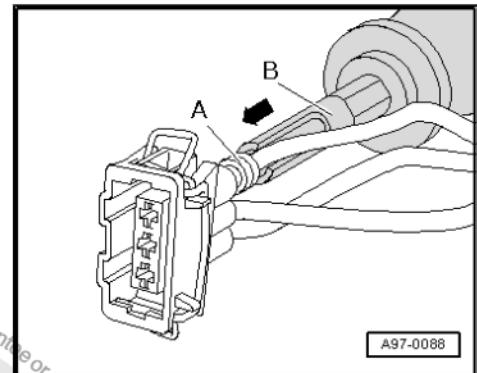
*The smallest diameter of the sheath shall point to the connector.*

- Move single cable lining -A- on the repair cable to the connector.

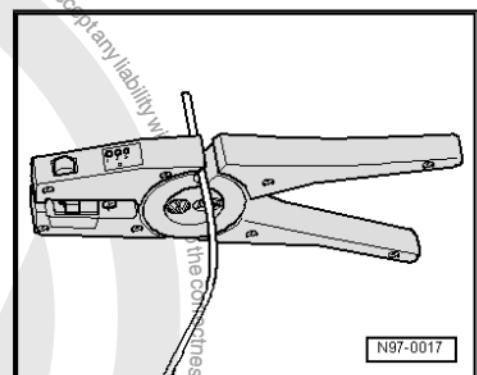




- Insert single cable lining -A- with the respective assembly tool -B- to the connector stanchion.



- Shorten the repair cable and the original single harness cable, as necessary, with Wire stripper -VAS 1978/3- .
- Compress the original harness' repair cable and single cable stripped tips with the crimping pliers and a pressure connection, as described in chapter "Interruption on cables with one repair region" [⇒ page 217](#) .

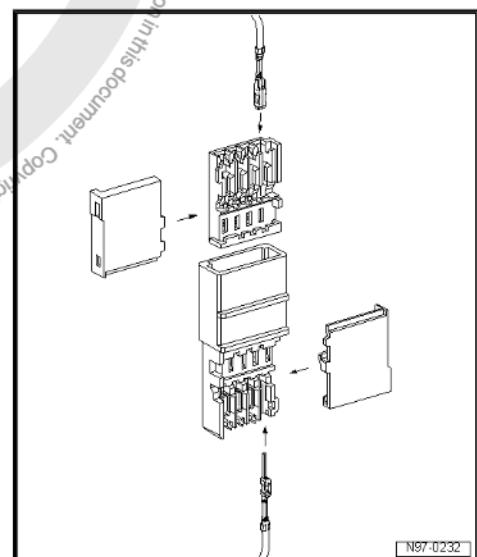


#### 6.5.4 Repair of connectors with cut/compression technique



##### Note

- ◆ Due to technical reasons, the connectors related to the cut/compression procedure can be exclusively supplied with inserted compression/cut terminals.
- ◆ In case they are not required, these terminals can be removed the same way as all others.
- ◆ The provided repair cables already have terminals that have been integrated with the corresponding crimping process ⇒ Electronic Parts Catalogue (ETKA) .





## 6.6 Unlock and disassemble connectors

### 6.6.1 Notes on unlocking and disassembling connectors

#### Note

- ◆ Pay attention to the notes related to electrical system repair jobs [page 210](#).
- ◆ In order to unlock, always use the proper unlock tool. Under no circumstance shall the terminals be removed by force from the connectors.
- ◆ Damaged connectors shall be always replaced.
- ◆ In order to release secondary lock devices, use a small screwdriver.
- ◆ The pins arrangement is engraved on the secondary lock device or on the rear part of the connector.
- ◆ Additional information about terminal assembly locations  
⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

The correspondence of the assembling tools indicated for the corresponding lock devices can be referred to on the table of ⇒ Instruction Manual of -VAS 1978/35- .

### 6.6.2 Secondary lock

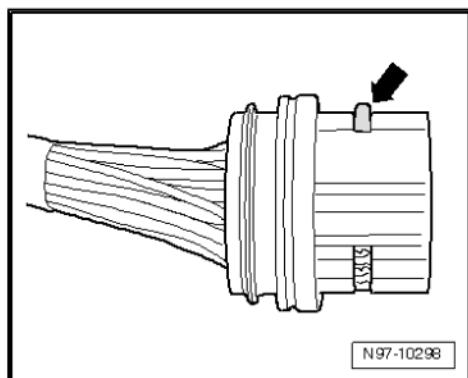
The secondary lock device is a fixing device (additional lock device) which fixes all cables at a connector. If a connector has a secondary lock device, it shall always be unlocked or removed prior to unlocking and removing a terminal with proper tool.

The secondary lock device distinguishes from the other connector components by its color. This simplifies the recognition of the secondary lock device and clarifies its corresponding function.

The connector types below are some shining examples to illustrate the distinct function modes of secondary lock devices.

#### Example 1

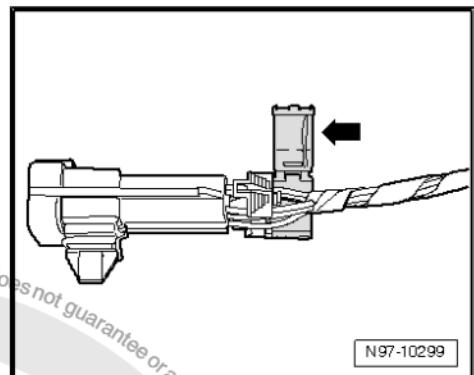
The locking device is released by removing the "comb-type element" -arrow-.





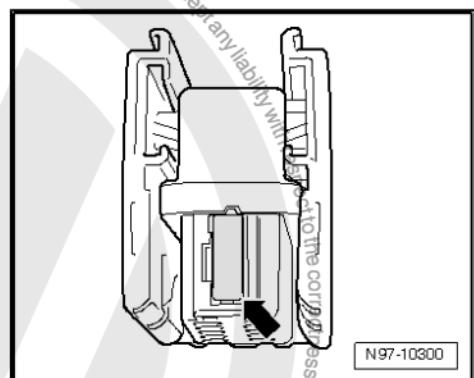
### Example 2

The lock device is released through the opening of a "cover" -arrow-.



### Example 3

The lock device is released by removing a "sliding lock" -arrow-.



## 6.6.3 Primary lock

The primary lock device is the fit which fixes a terminal to a connector.

If there are secondary lock devices, unlock or remove them prior to loosening the terminals with a proper tool using a tool that is appropriate for such a procedure [⇒ page 224](#).

The primary lock devices below are some shining examples to illustrate the distinct function modes of primary lock devices.

- ◆ Round terminal securing systems [⇒ page 225](#)
- ◆ Flat terminal securing systems [⇒ page 226](#)
- ◆ Special terminal securing systems [⇒ page 228](#)

The correspondence of the assembling tools indicated for the corresponding lock devices can be referred to on the table of [⇒ Instruction Manual of -VAS 1978/35-](#).

## 6.6.4 Round terminal securing systems



Note

*If there are secondary lock devices, unlock or remove them prior to loosening the terminals with a proper tool using a tool that is appropriate for such a procedure [⇒ page 224](#).*

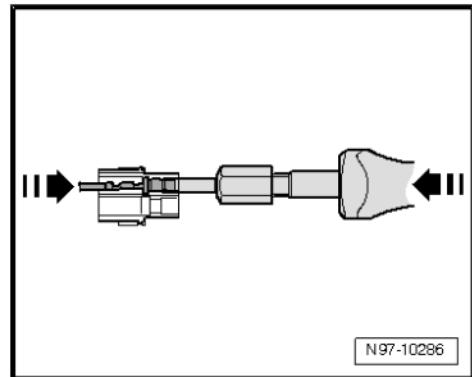


- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.
- Press the unlocking tool towards the connector -arrows- and remove the loose terminals from the connector.

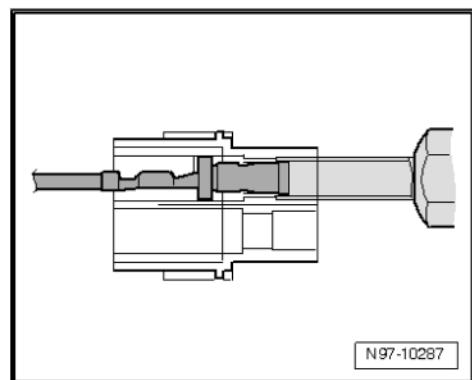


Note

*When pressing the terminal towards the connector, the securing locks release from the connector boss, thus allowing removal with the unlock tool.*



- After removing the terminal, the unlock tool can be removed from the connector.



### 6.6.5 Flat terminal securing systems

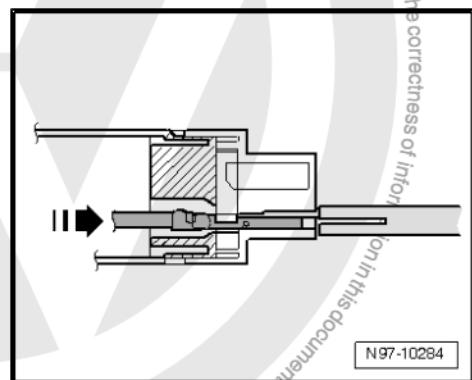


Note

*If there are secondary locking devices, unlock or remove them prior to loosening the terminals using a proper tool [⇒ page 224](#).*

#### Flat terminal securing systems with securing boss

- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.



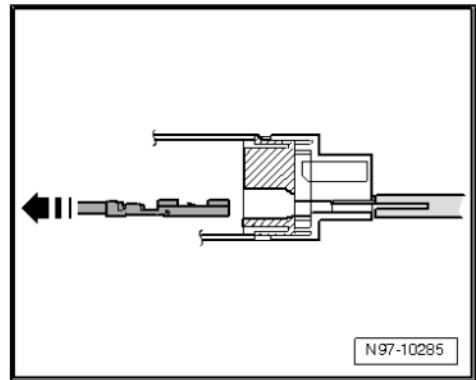


- Press the unlocking tool towards the connector -arrow- and remove the loose terminals from the connector.



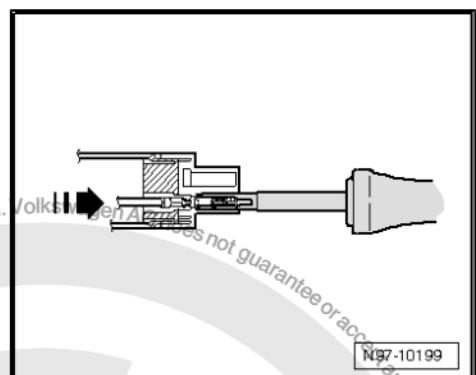
**Note**

*When pressing the terminal towards the connector, the securing locks release from the connector boss, thus allowing removal with the unlock tool.*



**Flat terminal securing systems with securing boss**

- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.

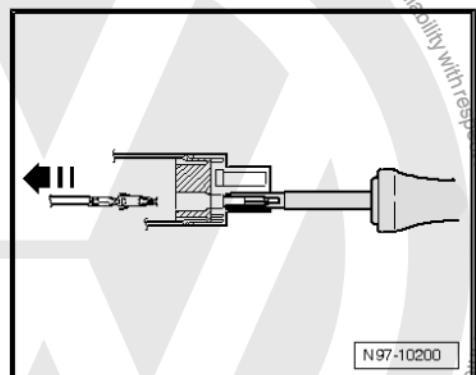


- Press the unlocking tool towards the connector -arrow- and remove the loose terminals from the connector.



**Note**

*When pressing the terminal towards the connector, the securing locks release from the connector boss, thus allowing removal with the unlock tool.*



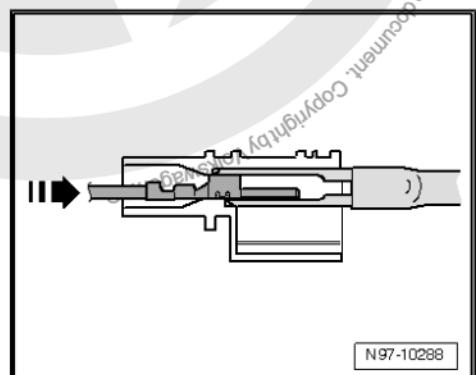
**Asymmetry**

- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.



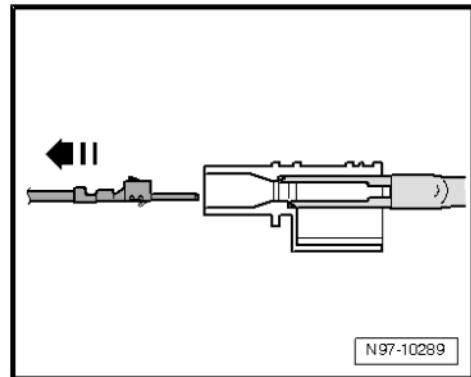
**Note**

*When pressing the terminal towards the connector, the securing locks release from the connector boss, thus allowing removal with the unlock tool.*





- Press the unlock tool towards the connector arrow and remove the loose terminals from the connector -arrow-.
- After removing the terminal, the unlock tool can be removed from the connector.



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### 6.6.6 Special connector securing device



Note

*If there are secondary lock devices, unlock or remove them prior to loosening the terminals with a proper tool using a tool that is appropriate for such a procedure [⇒ page 224](#).*

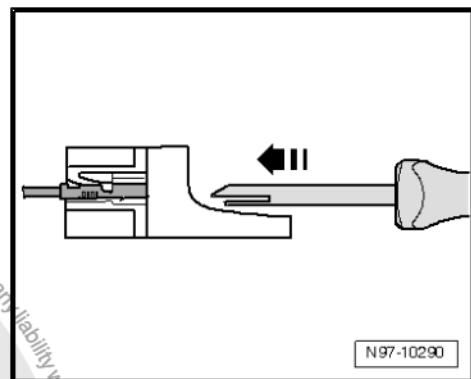
#### Faston auxiliary terminals

- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.



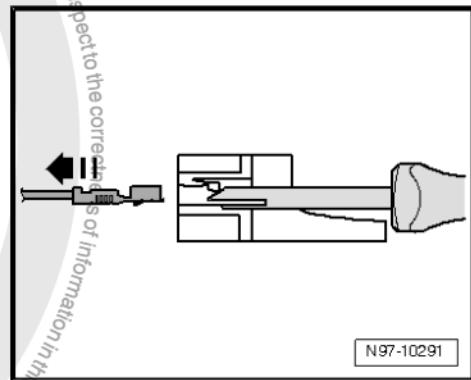
Note

*When pressing the terminal towards the connector, the securing locks release from the connector boss, thus allowing removal with the unlock tool.*



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- Press the unlock tool towards the connector arrow and remove the loose terminals from the connector-arrow-.
- After removing the terminal, the unlock tool can be removed from the terminal box.

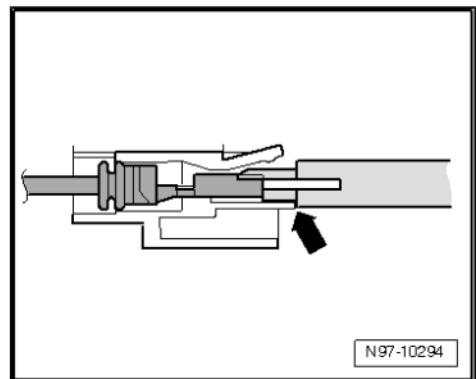


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### Terminals GT 150/280

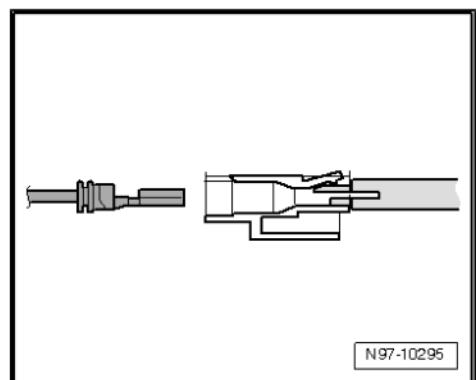
- Insert the indicated unlock tool for the regarded connector in the unlock channel.
- Insert the terminal in the cable and slightly press it inside the connector -arrow-.



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The terminal is expelled from the connector.

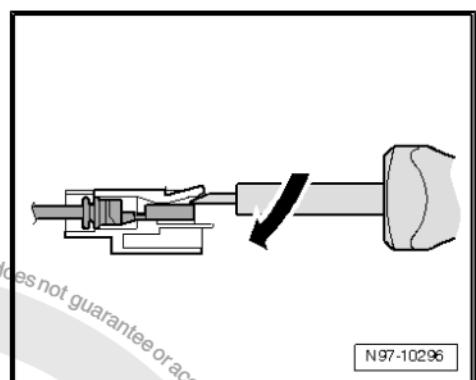
- After removing the terminal, the unlock tool can be removed from the terminal box.



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### Terminals without securing bosses

- Insert the unlock tool from below the connector securing boss.
- Press the unlock tool until the stopper, slightly lifting it -arrow-.

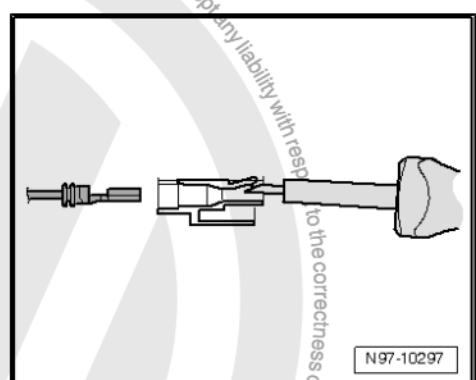


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The terminal is expelled from the connector.

- After removing the terminal, the unlock tool can be removed from the terminal box.

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